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Original Article

Hearing Outcome of Stapes Surgery in NIENT, Bangladesh

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Abstract:

Objective: *The aim of this study was to evaluate hearing outcome after stapedotomy in patients with Otosclerosis .*

Methods: *This cross sectional study was carried out from July 2017 to January 2019 in National Institute of ENT, Unit V.*

About 22 patients with Otosclerosis were included in this study. Diagnosis of Otosclerosis was based on the history, medical status with Otoscopy, Tuning fork tests and Audiometric tests. We compiled data on the pre and post operative air-bone gap (ABG) at 0.5, 1, 2 KHZ. The ABG was Calculated using AC and BC thresholds on the same audiogram.

Post operative hearing gain was then Calculated from the ABG before the operation minus the ABG of the last follow up examination .

Results: *In this study most of the cases were age group 14-30 years (72.7%), female (54.5%). Most common symptoms was progressive hearing loss, tinnitus (77.8%).The average pre-operative hearing loss in this study was (AC) was 48.31±7.68. The average post opt. hearing (AC) at follow up was 28.95±10.30 with an average hearing gain of 15.40±8.53 dB which was significant. The average pre-operative ABG was 28.99 dB ± 8.10. The average post opt. ABG was analyzed at 1 follow up showed ABG 13.18±8.09 dB which was found to be significant.*

Conclusion: *Stapedotomy is an effective surgical procedure for the treatment of otosclerosis which leads to improvement in patient's quality of life. A favorable hearing outcome can be obtained by the combination of experienced hands with minimal surgical trauma and appropriate surgical technique.*

Key wards: *Otosclerosis, hearing outcome, stapes surgery.*

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Introduction:

Otosclerosis is the most common etiology of conductive hearing loss in 15-50 years old patients with intact tympanic membrane. [1] It is the primary disease of the human temporal bone. It is an autosomal dominant hereditary disease with variable penetrance. Clinically, progressive conductive hearing loss and tinnitus are the main symptoms.[2,3] It is confined to otic capsule and can cause sensory-neural or mixed hearing loss as well as conductive hearing loss.[4] Clinical

Otosclerosis is present in .5% - 1% of the population and shows bilateral symptoms in 70% - 85% of cases. Otosclerosis is more commonly diagnosed in women (Female: Male ratio of 2:1) and most frequently affects white individuals aged 20-40 years. It is less common in Asians and rare in Africans. [1,2,5,6] The etiology of Otosclerosis has not been fully elucidated, despite numerous studies, however many theories have been suggested to explain it on the basis of genetic, viral, hormonal and other factors [7,8,9,10] Treatment options for Otosclerosis include medications, use of hearing aids and surgery. Medical treatment is indicated in the early active stage of the disease, which usually goes unnoticed, while hearing aids tend to be indicated when patients refuse surgery. The surgical treatment of Otosclerosis is the most commonly used and most effective treatment.[11] Variable complications may occur after stapes surgery, but the most worrisome complication is sensorineural hearing loss (SNHL) which occurs in less than 0.5% of patients[12,13,14]

Methods:

All the cases of stapedotomy were done from July 2017 to January 2019 at National Institute of ENT, Unit –V.

Diagnosis of Otosclerosis was based on the history, medical condition with Otoscopy, Tuning fork tests and Audiometric tests . We compiled data on the pre and post operative air-bone gap (ABG) at 0.5, 1,2 KHZ. The ABG was Calculated using AC and BC thresholds on the same audiogram.

Post operative hearing gain was then Calculated from the ABG before the operation minus the ABG of the last follow up examination.

Type of study: Cross Sectional study

Study period:

July 2017 to January 2019 (One and half years).

Study population:

Number of Patients: 22

Inclusion Criteria:

Otoscopy : TM intact

Tuning fork tests : Rinne Negative

Audiometric tests:

BC Level	0 – 25 dB
AC Level	45 – 65 dB and
ABG	15 dB or more

Exclusion Criteria :

Hearing Loss > 65 dB.

Cochlear Otosclerosis

A questionnaire was made for tinnitus :

Complete remission

Descreased.

Increased.

No change of tinnitus

Objectives: The aim of this study was to find out the hearing outcome after stapedotomy in patients with Otosclerosis .

Results:

Table I :

Age distribution of the study subjects

Age in years	Frequency	Percentage	Mean±SD
≥30	16	72.7	27.68±7.71
31-40	5	22.7	
>40	1	4.5	

Table II :

Preoperative data

	Frequency	Percentage (%)
Tinnitus		
Yes	16	77.8
No	6	22.2
Dizziness		
Yes	4	18.2
No.	18	81.8

Table III :
Clinical features

	Frequency	Percentage (%)
TM		
Intact	20	90.9
Retracted/ thin	2	9.1
Rinne test (Right)		
Positive	2	9.1
Negative	20	90.9
Rinne test (Left)		
Positive	4	18.2
Negative	18	81.8
Weber		
laterilazed left	17	77.3
Central	5	22.7
ABC		
Equal	18	81.8
Decreased	4	18.2

Table IV :
Mean distribution of pre-operative and post operative hearing loss

	Pre-operative	Post-operative	P value
AC	48.31±7.68	28.95±10.30	0.001
BC	18.45±6.57	14.68±5.62	0.001
ABG	28.99±8.10	13.18±8.09	0.001

Hearing improvement:
90.9% Hearing improvement
9.09% Hearing deterioration
Tinnitus Outcome:

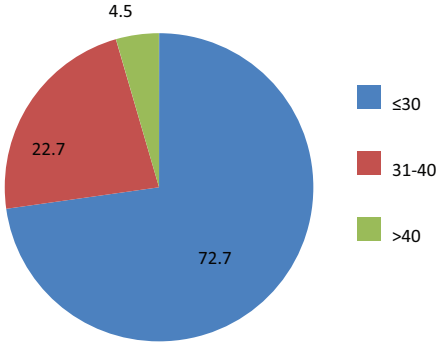

Fig.-1: Age distribution of the study subjects in Percentage (%)

Discussion:

Otosclerosis is a genetically mediated metabolic bone disease that affects only the human otic capsule and ossicles. Its mode of inheritance is autosomal dominance, but both its penetrance and expressivity are variable. Only three patients in this study had probable family history of otosclerosis. It is believed that otosclerosis could be inherited in some other modes (other than dominant alone) and incomplete expression of the gene is playing a vital role in skipping generations.[15]

The minimum age in this study group was 14 years and maximum was 45 years. The maximum number of patients was in the age group of 14-30 years (72.7%). The age of the patients at the time of surgery ranged from 14 to 45 years, with an average age was 27.68±7.71 years. Mahfudz et al.[16] reported the age of the patients at the time of surgery ranged from 17 to 55 years, with an average of 40.03 years. Kos et al.[17] found an age range of 17 to 75 years with an average of 43 years in his series. However Lippy WH et al. found a late age presentation with an average age of 50 years.[18]

Age does not significantly affect the success rate of stapes surgery. Kulakova et al.[19] found that the surgical intervention on the stirrup bone for the treatment of otosclerosis in the patients above 65 years of age is a safe and efficacious method despite marked hearing impairment in this group of patients. Massey et al.[20] evaluated the outcome of stapedectomy surgery for congenital stapes fixation and found that stapedotomy remains an effective method to achieve significant hearing improvement in the majority of patients for congenital fixation. Age is not detrimental to hearing gain and instead might result in better use of hearing aids in older adults, thus facilitating social hearing recovery.[21]

This study shows female were predominant than male. The ratio of women and men was 1.2:1. This findings consistent with the study of India, men to women ratio range from 1.2:1 to 1.48.[15,22] Another study reported women are affected twice as often as are men[2]. Mahfudz et al. reported the ratio of women to men was 1.4:1. The success of stapes surgery for otosclerosis is not dependent on sex of the patients.[16] The prevalence of otosclerosis is greater in women, with a 2:1 female-to male distribution.[23]

The average pre-operative hearing loss in this study with titanium was (AC) was 48.31±7.68. The average post opt. hearing (AC) at follow up was 28.95±10.30 with an average hearing gain of 15.40±8.53 dB which was significant. This was similar to results of Boleas-Aquirre et al.[24] who reported the overall improvement in air conduction thresholds and pure-tone average air conduction for all frequencies after 1 year of surgery. Ataide et al.[25] did audiometric evaluation after stapedotomy with Fisch titanium prosthesis and showed improvement post operatively. The increased mean hearing gain was also reported by Boleas-Aquirre et al.[24]

In this study, the average pre-operative ABG was 28.99 dB ± 8.10. The average post operative ABG was analysed at 1 follow up showed ABG of 13.18±8.09 dB which was found significant. This was similar to the study of Vishwakarma et al. where the mean postoperative ABG was 8.2 dB respectively.[26] The air-bone gap with titanium in the study of Boleas-Aguirre et al.[24] was significantly reduced 1 year after surgery and remained so at 4 years. Preoperative air-bone gap, 34.04 dB; at 1 year, 16.40 dB; at 4 years, 17.3 dB. Ataide et al.[25] found out that the mean low-frequency postoperative air-bone gap was 12.9 dB. Twenty-five (75.8%) patients had air-bone gaps of 10 dB and under; 32 (96.9%) patients had gaps of 20 dB and under; and all patients had gaps of 30 dB and under.

In this study shows 77.8% patients had tinnitus. These findings are in accordance with the literature, where tinnitus is described in 40–90% of the cases before surgery and some beneficial effects of the surgery were noted.[27-32] Vertiginous episodes were experienced in about one-fifth of the cases before surgery, at early and late follow-up in about 15% of the cases. Literature describes 15–20% of cases reporting some vertigo pre- and postoperatively, with up to 25–30% experiencing obvious vertigo early postoperatively, probably related to the surgical procedure.[21,23,25]

This study shows the average gain was 15.40±8.53 dB. Therefore, the findings of the study are in well agreement with the findings of the other research works[16,26]. They found the average gain in air conduction was 27 dB and majority had air conduction gain in the group of 31-40 dB. Ueda H et al also found an average gain of within 30 dB.[27]

All patients wth conductive hearing loss caused by otosclerosis may use hearing aids as an alternative to surgery. If the patient has a significant sensorineural component to the hearing loss, a hearing aid may be required even after successful stapedotomy. A patient with far advanced otosclerosis requires a hearing aid at all times. It may take 4 months before these patients can tolerate and benefit from the hearing aid.

Conclusion:

Stapedotomy is an effective surgical procedure for the treatment of otosclerosis which leads to improvement in patient's quality of life. A favorable hearing outcome can be obtained by the combination of experienced hands with minimal surgical trauma and appropriate surgical technique.

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