DOI: https://doi.org/10.53350/pjmhs2023172389

ORIGINAL ARTICLE

Hearing Improvement after Myringoplasty in Association with the Tympanic Membrane Perforation Size

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ABSTRACT

Objectives: To evaluate hearing improvement following successful myringoplasty based on the degree of tympanic membrane perforation.

Methods: This cross-sectional study was held in the department of ENT of Aziz Bhatti Shaheed Teaching Hospital and ENT, Head and Neck Surgery department, Pak International Medical College and Peshawar Institute of Medical Sciences (PIMS), Hayatabad Peshawar for the duration from December 2021 to November 2022. Myringoplasty procedures were performed on 80 individuals in total following thorough history-taking, clinical testing, and research. Hearing was tested both before and after the operation. A variety of tables, charts, and drawings are used to present the analysed data.

Results: For minor perforations, 27.81 dB was the mean air-bone gap, 7.21 dB was the mean bone conduction threshold, and 33.40 dB was the mean air conduction threshold prior to surgery. In medium-sized perforations, 32.78 dB was the mean air-bone gap, 10.10 dB was the mean bone conduction threshold and 46.21 dB was the mean air conduction threshold prior to surgery. In the instance of a large perforation, 48.86 dB was the mean air-bone gap, 62.01 dB was the mean air conduction threshold, and 15.20 dB was the mean bone conduction threshold prior to surgery. After myringoplasty, the mean postoperative air-bone gap for medium, large and small perforations was 14.22 dB, 22.62 dB and 6.24 dB, correspondingly. Using the unpaired test, it was determined that the difference in airbone gap between minor and medium sized perforations closure was statistically significant.

Conclusions: After myringoplasty of large size perforations, hearing gain is improved significantly. Myringoplasty and hearing enhancement are key words.

Keywords: Myringoplasty, Hearing Improvement, Tympanic membrane perforations

INTRODUCTION

Otitis media with chronic purpura is a major health concern. Because of Pakistan's poor socioeconomic conditions, excessive population, malnutrition, and lack of health education, this disease is quite common[1-2]. The tubo-tympanic variety, which is always distinguished by the central tympanic membrane perforation is the more prevalent of the two kinds of chronic purulent otitis media[3]. Hearing loss and discharge are related to perforation[4]. Due of its long-standing impact on development of language, communication, academic accomplishment and the educational process, this hearing loss is a major issue for people all over the world, especially in children and young adults[5-6]. Adult hearing loss is a hardship on the person, their family, and society. Hearing loss and perforation dimensions have a strong quantitative relationship. The myringoplasty treatment helps the patient hear better[7-8]. In my studies, I have demonstrated that big tympanic membrane perforations following successful myringoplasty lead to greater improvements in hearing[9-10]. The term "myringoplasty" refers to the surgical treatment for a perforated eardrum. Tympanic membrane perforations have been repaired since the 16th century. Myringoplasty has become one of the treatments for laryngological perforation of the ear, nose, and throat in adults and children as a result of the invention of the operating microscope, the advancements in anesthesia, development of antibiotics and the use of inoculum materials[11]. The region of the tympanic membrane that was impacted was used to categorise perforation size, Small perforation if < 25%, medium size if perforation size is between 50–75% and large if >75% perforation size of the pars tensa[12]. Improved hearing is one benefit of a myringoplasty that is effective. The large perforation closure led to better improvement in hearing than with a small perforation and also the significant air-bone gap reduction after myringoplasty, and better hearing, according to the audiometric outcomes of myringoplasty[13]. According to the Black Jh study, the postoperative air-bone gap was <20 dB in 78.2% of patients. In a different research, 70.6% of patients showed audiological improvement[14-15].

METHODS

A total 80 patients who were done with myringoplasty in the department of ENT of Aziz Bhatti Shaheed Teaching Hospital and ENT, Head and Neck Surgery department, Pak International Medical College and Peshawar Institute of Medical Sciences (PIMS), Hayatabad Peshawar were included in the study, and it was conducted during the period from December 2021 to November 2022. The clinical findings, patient's descriptive history, clinical examination with a tuning fork, a radiographic examination with a Town view X-ray of the mastoid process, a laboratory evaluation, and hearing function test (impedance audiometry and pure tone audiometry) were all used to evaluate all the patient. A small proportion of patients received local anesthesia while the maximum patients underwent general anesthesia. The post auricular approach was used for the majority of myringoplasty surgeries. Depending on the external auditory canal status and the perforation site in the remaining patients, a transcanal approach was taken into consideration. All patients received grafts made from temporal fascia. The Under Lay technique was applied in all patients. Surgery was done on one ear in patients who had disease in both ears. Various surgeons carried out the operations. After surgery, patients were monitored for up to three months. At the conclusion of the first month, there is a first inspection, and at the end of the third month, there is a second inspection. The second follow-up appointment included pure-tone audiometry. During the follow-up, tympanic membrane, the external auditory canal and wound health were assessed. Pure-tone audiometry with airspace closure was used to measure the hearing gain following myringoplasty.

RESULTS

80 patients were prospectively studied for the study. The patients in this study ranged in age from 10 to 50. There were 35(43.8%)

and 45(56.2%) females. The majority of the patients were in the 21-30 years of age-group 38(47.5%).

Table-1: shows the patients distribution with reference to age-group

Age group (years)	Male	Female	N(%)
10-20	13(37.1%)	10(22.2%)	23(28.8%)
21-30	20(57.1%)	18(40%)	38(47.5%)
31-40	2(5.8%)	12(26.7%)	14(17.5%)
41-50	0	5(11.1%)	5(6.2%)
Total	35(43.8%)	45(56.2%)	80(100%)

Table-2: shows the distribution of patients with reference to Gender, Education level and Residence

Gender	N(%)
Males	35(43.8%)
Females	45(56.2%)
Total	80(100%)
Education Level	
Primary	20(25%)
Secondary	35(43.8%)
Illiterate	6(7.5%)
Graduate and above	12(15%)
Higher secondary	7(8.7%)
Total	80(100%)
Residence	
Rural	42(52.5%)
Urban	38(47.5%)
Total	80(100%)

The majority of the patients were secondary school qualified 35(43.8%) and 42(52.5%) of the patients were from the rural area.

Table-3: shows the patients features with reference to clinical features, anesthesia given, perforation size and surgical approach used

Symptoms	
Impaired of hearing	74(92.5%)
Intermittent otorrhoea	76(95%)
tinnitus	20(25%)
Anesthesia Type	
General	72(90%)
Local	8(10%)
Size of perforation	
Small	37(46.3%)
Medium	30(37.5%)
Large	13(16.2%)
Total	80(100%)
Surgical approach	
Trans canal	10(12.5%)
Post auricular	70(87.5%)
Total	80(100%)

The impaired healing was noted in 74(92.5%), Intermittent otorrhoea in 76(95%) and tinnitus in 20(25%) of cases. 37(46.3%) patients have small size perforation, 30(37.5%) patients have medium size perforation and 13(16.2%) patients have large size perforation. The Post auricular approach was used in 87.5% of patients and 72(90%) patients were given general anesthesia.

Table-4: shows the patients distribution with reference to tympanic membrane perforation size and its relation with preoperative hearing threshold

Perforation size	Bone conduction threshold	Air conduction threshold	Air bone gap
	Mean (dB)	Mean (dB)	Mean (dB)
Small	7.21	33.40	27.81
Medium	10.10	46.21	32.78
Large	15.20	62.01	48.86

For minor perforations, 27.81 dB was the mean air-bone gap, 7.21 dB was the mean bone conduction threshold, and 33.40 dB was the mean air conduction threshold prior to surgery. In medium-sized perforations, 32.78 dB was the mean air-bone gap, 10.10 dB was the mean bone conduction threshold and 46.21 dB was the mean air conduction threshold prior to surgery. In the instance of a large perforation, 48.86 dB was the mean air-bone gap, 62.01 dB was the mean air conduction threshold, and 15.20 dB was the mean bone conduction threshold prior to surgery.

Table-5: shows the patients distribution with reference to hearing improvement after myringoplasty (n=80)

Size of perforation	Bone conduction threshold	Air conduction threshold	Air bone gap
	Mean (dB)	Mean (dB)	Mean (dB)
Small	7.1	13.04	6.24
Medium	8.22	20.19	14.22
Large	10.08	30.15	22.62

After myringoplasty, the mean postoperative air-bone gap for medium, large and small perforations was 14.22 dB, 22.62 dB and 6.24 dB, correspondingly. The recording reveals that for small perforations, the average improvement in the hearing gain or air-bone gap was 5.94 dB, respectively.

DISCUSSION

After the proper history taking, clinical examination, research, and follow-up, 80 patients were prospectively studied for the study. Postoperative pure-tone audiometry with closure of the bone air gap was used to evaluate the hearing gain following myringoplasty. The patients in this study ranged in age from 10 to 50. The patients were 26 years old on average. Myringoplasty had a maximum success rate of 50% in patients aged 21 to 30; 26.67% in those aged 10 to 20; 18.33% in those aged 31 to 40; and 5% in those aged 41 to 50. The majority of patients are from the lower class, 10% from the upper class, and 48.33% of them are from the middle class. The majority of the patients were secondary school qualified 35(43.8%) and 42(52.5%) of the patients were from the rural area. The impaired healing was noted in 74(92.5%), Intermittent otorrhoea in 76(95%) and tinnitus in 20(25%) of cases. 37(46.3%) patients have small size perforation, 30(37.5%) patients have medium size perforation and 13(16.2%) patients have large size perforation. The Post auricular approach was used in 87.5% of patients and 72(90%) patients were given general anesthesia. Hearing loss and intermittent ear discharge were the main signs of this series. Intermittent ear discharge was present in all patients, hearing loss affected 96.67% of them, and tinnitus affected 20%. Of the 80 patients, 50 had bilateral disease and 30 had unilateral disease; however, surgery on the bilateral patients was done on one ear at a time.

The fundamental procedure for myringoplasty was used on all patients. In all patients, temporal fascia was employed as a transplant material[16-17]. For minor perforations, 27.81 dB was the mean air-bone gap, 7.21 dB was the mean bone conduction threshold, and 33.40 dB was the mean air conduction threshold prior to surgery. In medium-sized perforations, 32.78 dB was the mean air-bone gap, 10.10 dB was the mean bone conduction threshold and 46.21 dB was the mean air conduction threshold prior to surgery. In the instance of a large perforation, 48.86 dB was the mean air-bone gap, 62.01 dB was the mean air conduction threshold, and 15.20 dB was the mean bone conduction threshold prior to surgery. The perforation's size determines how much hearing is lost. It was demonstrated that hearing loss became greater with the larger perforation[18-19]. In a study similar to this one, Farrior and Lee demonstrated that hearing loss increased as the size of the perforation increased[20-21]. After myringoplasty, the mean postoperative air-bone gap for medium, large and small perforations was 14.22 dB, 22.62 dB and 6.24 dB, correspondingly. According to the data, the average improvement in the air-bone gap or the increase in hearing for minor perforations was 5.24 dB, respectively[22-23].

CONCLUSION

The results of this study support the hypothesis that the extent of the tympanic membrane perforation influences the severity of

hearing loss and recovery of hearing following myringoplasty. In terms of the perforation size, the hearing gain was minimal for small perforations and maximal for medium and big perforations. Therefore, it has been demonstrated that hearing amplification is preferable for large perforations following a successful myringoplasty.

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