Success Rate of Intact Canal Wall Tympanoplasty in Safe Type of Chronic Suppurative Otitis Media' Patients

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Abstract

Background: Surgical therapy for chronic suppurative otitis media (CSOM) is by tympanoplasty with or without mastoidectomy. The purpose of surgery is to eradicate the source of infection. Success indicators of tympanoplasty are achieving dry ears without recurrent otorrhea, myringoplasty, and an increase in the hearing threshold.

Objectives: is to know the success rate of intact canal wall tympanoplasty in safe type CSOM patients.

Methods: Retrospective descriptive was used in this study. All safe-type of CSOM patients undergoing intact canal wall tympanoplasty surgery from January to December 2018 at Dr. Soetomo General Hospital were used as the participant data.

Results : There were 32 participants, divided into a higher proportion of males than females (ratio 1.1: 1). The characteristics of the participants included; the most age group were 21-30 years (37.50%), origin outside Surabaya (59.37%), and high school education level (62.50%). Most perforations were subtotal (40.63%) and hearing loss was conduction (62.50%). Apparently, 56.25% were patent Eustachian tubes, 90.63% were sclerotic mastoid Schuller photographs, and 62.50% were granulation tympanic cavity findings. Additionally, 78.13% were performed tympanoplasty type 1. The results of postoperative eradication showed dry ears (84.38%) and successful of myringoplasty (71.88%). The mean increase in the hearing threshold for AC, BC, and ABG after surgery was 15.98 dB, 4.57 dB, and 11.40 dB.

Conclusion: The results of eradication after intact canal wall tympanoplasty were mostly dry ears, successful myringoplasty, and an increase in the mean hearing threshold of AC, BC, and ABG.

Keywords: *Chronic Suppurative Otitis Media, Safe Type, Intact Canal Wall Tympanoplasty, Intact Canal Wall Up Mastoidectomy*

Introduction

Chronic suppurative otitis media (CSOM) is a chronic middle ear infection that lasts more than two months. It was characterized by a perforation of the tympanic membrane and continuous or intermittent discharge of secretions from the ear..[1] Chronic suppurative otitis media (CSOM) is an ear disease inflammation commonly found in developing countries. The data from WHO (World Health Organization) shows that the prevalence of CSOM in developing countries such as Malaysia, the Philippines, and Thailand is still relatively high, namely 2-4% compared to developed countries in Europe such as Australia, England, Denmark and Finland which is around 0.4%.[1,2] The survey conducted in seven provinces in Indonesia was obtained the prevalence of

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CSOM was 3.6% of the Indonesian population.[1] The low socio-economic life, slum environment, poor health, and nutritional status are risk factors that form the basis for the increasing prevalence of CSOM in developing countries.[2]

The management of the safe type of CSOM consists of non-surgery and surgery. The surgical option for safe type CSOM is tympanoplasty with or without mastoidectomy.[1] The purpose of surgical therapy for tympanoplasty is to eradicate the infection from reaching dry ears, while another is to improve hearing.process.[3] A number of studies have reported the success factor of tympanoplasty influenced by age, perforation size, location of the perforation, ear condition before surgery, condition of the tympanic cavity during surgery, and Eustachian tube patency. Other factors are also influenced by operating technique, operator experience, previous surgery history, and smoking status.[3,4] The success indicators of tympanoplasty surgery are achieving dry ears without recurring otorrhea, myringoplasty, and an increase in the hearing threshold..[5] This study purpose is to determine the clinical characteristics of safe type CSOM patients undergoing intact canal wall tympanoplasty.

Method

A retrospective descriptive study was used with medical record data for January - December 2018 at out-patient care, Otology division of Dr. Soetomo General Hospital. The study inclusion criteria were patients with safe type CSOM who were undergoing intact canal wall tympanoplasty surgery. The study exclusion criteria included safe-type CSOM patients who underwent revision surgery, congenital anomalies, and incomplete medical record data. There were 136 patients with a diagnosis of safe type CSOM and 56 patients (41.18%) of whom underwent intact canal wall tympanoplasty surgery. The data that met the inclusion criteria were 32 patients. Participants were identified based on demographic data, clinical findings, plain Schuller mastoid radiograph, Eustachian tube patency test, operative findings, and type of tympanoplasty. The postoperative evaluation consisted of postoperative eradication results, myringoplasty, and pure tone audiometry 3 months postoperatively. The data distribution was analyzed by using the SPSS version 16.0 program.

This study has gone through a research protocol and received approval from the Health Research Ethics Committee of Dr. Soetomo General Hospital, Faculty of Medicine, Universitas Airlangga, Ref. No. 0131 / LOE / 301.4.2 / X / 2020.

Results

Table 1. Distribution of respondent data

Characteristic	Amount	Percentage
Sex		
Male	17	53,13%
Female	15	46,88%
Age's Group		
11-20 years	11	34,38%
21-30 years	12	37,50%

Cont... **Table 1. Distribution of respondent data**

31-40 years	4	12,50%
41-50 years	3	9,38%
51-60 years	2	6,25%
Lived		
Surabaya	13	40,63%
Outside Surabaya	19	59,38%
Education		
Elementary School	1	3,13%
Junior High School	4	12,50%
Senior High School	20	62,50%
Bachelor Degree	7	21,88%
Jobs		
Civil Servants	2	6,25%
Private Employee	14	43,75%
Unemployed	16	50,00%

In this study, the male group was more than the female (1,1: 1). The most age group was in the population of 21-30 (37.50%) with ages between 13-58 years. Then, most of the patients were coming from outside Surabaya (59.38%). The highest education level was SMA (62.50%) and half of the participants were unemployed (50%) (Table 1).

Table 2. Distribution of Clinical Findings		
Characteristics	**Amount**	**Percentage**
Type of Perforation		
Central	11	34,38%
Total	8	25,00%
Subtotal	13	40,63%
Types of hearing loss		
A conductive deafness	20	62,50%

Cont... **Table 2. Distribution of Clinical Findings**

Mixed hearing loss	12	37,50%
Sensorineural deafness	0	0,00%
Eustachian tube function perforated test		
Patented	18	56,25%
Not Patented	10	31,25%
Partial	4	12,50%
Plain radiographs of schuller mastoid		
Sclerotic	29	90,63%
Diploid	2	6,25%
Pneumatic	1	3,13%

Based on the table above, most types of perforation were subtotal type (40.63%), while most types of hearing loss were conduction deafness (62.50%). The tubal patency test of this study showed that the majority of patients (56.25%) and plain radiographs of Schuller mastoid were mostly sclerotic (90.63%) (Table 2)..

Table 3. Distribution of the tympanic cavity during surgery and the type of tympanoplasty based on the pathological findings

Characteristics	**Amount**	**Percentage**
Pathology of the tympanic cavity		
Granulation	20	62,50%
Mucosal Thickening	3	9,38%
Tympanosclerosis	2	6,25%
Granulation + mucosal thickening	5	15,63%
Granulation + tympanosclerosis	2	6,25%
Type of tympanoplasty		
Type 1	25	78,13%
Type 2	2	6,25%
Type 3	3	9,38%
Type 4	1	3,13%
Type 5	1	3,13%

The most pathology finding of the tympanic cavity during surgery was granulation tissue (62.50%), while the most type of tympanoplasty often performed was tympanoplasty type 1 (78.13%) (Table 3)..

Table 4. Characteristics of intact canal wall tympanoplasty surgery		
Characteristics	**Amount**	**Percentage**
Results of postoperative eradication		
Dry	27	84,38%
Wet	5	15,63%
Myringoplasty		
Growth	23	71,88%
Failed	9	28,13%

The results of postoperative eradication showed dry ear conditions (84.38%) and the success of myringoplasty was 71.88% (Table 4).

The mean preoperative Air Conduction (AC) hearing threshold increased from 56.09 dB to 40.12 dB postoperatively, so that the mean increase in AC hearing threshold was 15.98 dB. The mean result of preoperative Bone Conduction (BC) hearing threshold increased from 18.91 dB to 14.34 dB postoperatively, so that the mean increase in BC hearing threshold was 4.57 dB. The results of the preoperative mean Air Bone Gap (ABG) increased from 37.19 dB to 25.79 dB postoperatively, so that the mean increase in ABG was 11.40 dB (Table 5).

Table 5. Pre and Post Operation Differences of AC, BC, and ABG						
Frequecy	Pre-			Post-		
	Mean ± Std (dB)	Intensity (dB)		Mean ± SD (dB)	Intensity (dB)	
(500,1000,2000,4000 Hz)		Min.	Max.		Min.	Max.
Average of AC	56,09±20,02	20,02	21,25	40,12±19,84	11,25	82,50
Average of BC	18,91±13,81	0	53,75	14,34±13,42	0	48,75
Average of ABG	37,19±18,52	2,5	83,75	25,79±15,04	2,50	60,00

Discussion

The safe type distribution ratio of Chronic suppurative otitis media (CSOM) sufferers based on sex was 1.1: 1, resulting in more males by 53.13% than females by 46.88%. Similar results were reported by Yurtas, et al., With a male to female ratio by 1.3: 1.[5] Research on hygiene categories showed females have higher hygiene standards than males. This psychological predisposition was related to the incidence of exposure to allergens, bacteria, and parasites.[6]

The population obtained in this study that most productive age was between 21-30 years (37.50%)

and the number decreased in the fourth to fifth decade. Research by Kumar, et al., Found that the largest age group was 21-30 years and decreases in the age group over 60 years.7 The safe type of CSOM patients who come to an outpatient unit of Dr. Soetomo General Hospital was 59.38% came from outside Surabaya. The majority come from small cities to rural areas in East Java. As reported by Parmar, et al., the difference in the incidence of CSOM among elementary school students in the village (5.11%) was higher than elementary school students in the cities (2.32%).[8] High incidence in small cities or rural areas is associated with a lack of education, education level, awareness of the disease, poor hygiene, and limited health services.[6,8] Half of the participants were unemployed (50%) and the highest level of education was high school (59.26%). Kumara, et al., Showed that CSOM is more common among people with lower socioeconomic status (39.4%). Sufferers of Chronic suppurative otitis media (CSOM) are often found in families with low socioeconomic status and income.[9] Inadequate socioeconomic conditions, malnutrition, poor hygiene, recurrent respiratory infections, and inadequate health care centers were the factors in the occurrence of CSOM.[6]

The most perforation type in this study was the subtotal type (40.63%). Thakur, et al., obtained similar results (43.6%).[10] The posterosuperior quadrant has more vascularization than other areas so if an inflammatory process occurs, it is susceptible to cell exposure. Repeated inflammation and negative intratympanic pressure effects tympanic membrane retraction until membrane rupture occurs, especially in areas with weaker structures.[11] The most common type of hearing loss in this study was the conduction type (62.50%). Similar results were reported by Kumar, et al.,[7] The results of chronic inflammation of the middle ear makes the formation of secretions, perforation of the tympanic membrane, and breaking the ossicular chain. This condition inhibits the transmission of sound waves from the middle ear to the inner ear causing conduction-type hearing loss.[12]

Mostly, Eustachian tube patency test showed a patent results (56.25%). Kumar, et al., Reported that patent tubes in safe type of CSOM patients was 76%..[7] Additionally, the inflammatory process of CSOM could change the pathology of tubal mucosa so it interferes with the function of the Eustachian tube. The inflammatory reaction causes mucosal epithelium hyperplasia, metaplasia, and edema to form granulations or polyps. The distribution of goblet cells and glandular increases in the bone and isthmus so it has an impact on tubal patency, especially the function of ventilation and drainage.[11] The plain Schuller mastoid radiograph showed mostly the sclerotic features (90.63%). Roy, et al., Obtained the same results with the largest picture being sclerotic (78.85%). The inflammatory process in CSOM affects mastoid pneumatization so the air cells mastoid tend to decrease. The duration is also believed to affect the degree of pneumatization of the mastoid air cells.[13]

The most common pathology of the tympanic cavity was granulation (62.50%). The same results were obtained in the study by Thakur, et al., which stated that Granulation is formed due to an inflammatory process in the middle ear and causes bone erosion in both the ocular chain and the tympanic cavity wall.[10] The tympanoplasty technique used in this study was based on the Wullstein classification. Most types of tympanoplasty were type 1 (78.13%). Similar research results were obtained by Antony, et al.,.[14] The purpose of tympanoplasty are to close the canal perforation, eradicate germs and improve hearing.[10] Evaluation of the radication results that carried out 3 months after the surgery was mostly dry ears (84.38%). The same result was reported by Puspitowati.[15] The purpose of surgery for CSOM is to eradicate the source of infection and achieve dry ear conditions.[4]

Postoperative myringoplasty was mostly successful (71.88%). Yurtas, et al., Showed myringoplasty were not much different (75%). Eustachian tube patency was one of the factors that play a significant role as a prognostic

for the success of safe type CSOM surgery because it is considered to provide an image of aeration in the middle ear. Patients with normal tubal function show a better ratio of myringoplasty growth outcomes than abnormal tubal function.[5] Several studies reported that the success of tympanoplasty formation also influenced by age, perforation size, location of the perforation, preoperative ear conditions, and the condition of the tympanic cavity during surgery. Surgical technique, operator experience, previous surgical history, and smoking status are also factors in the success of tympanoplasty.[4]

In this study, the means postoperative AC hearing threshold increased by 15.98 dB. The mean postoperative BC hearing threshold increased by 4.57 dB and ABG increased by 11.40 dB. Additionally, Similar results were reported by Dangol and Shrivastav with AC hearing threshold was an increase in postoperative by 11.45 dB and ABG by 8.9 dB. Post tympanoplasty hearing improvement can be affected by the degree of ocular bone damage. The increase in the hearing threshold appears to be more significant in good ossicle conditions.[4]

Conclusion

The results of postoperative eradication were mostly obtained as a dry ear by 84.38%. The myringoplasty was successful by 71.88%. There was an increase in the mean postoperative hearing threshold of AC by15.98 dB, BC hearing threshold by 4.57 dB, and ABG by 11.40 dB.

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