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Evaluation Of Patients After Canal Wall-Up Tympanoplasty in Dr. Soetomo General Hospital

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ABSTRACT

Background: Chronic Suppurative Otitis Media (CSOM) is a chronic inflammation of the middle ear mucosa and mastoid cavity. It is characterized by tympanic membrane perforation and a history of ear canal discharge (otorrhea). CSOM is classified into two types: safe type CSOM (mucosal or benign type) and dangerous type CSOM (bone or malignant type). Canal wall-up tympanoplasty (CWU) surgery is performed to treat the safe type of CSOM.

Objective: To describe the profile of the safe type CSOM patients after CWU tympanoplasty in Dr. Soetomo General Academic Hospital.

Method: This study was a retrospective descriptive using medical record data at the otology division, ORL-HNS Outpatient, Dr. Soetomo General Academic Hospital Surabaya. The study population was all the safe type CSOM patients who underwent CWU tympanoplasty surgery from January 2018 - December 2020.

Result: The study included 76 patients with safe-type CSOM who underwent CWU tympanoplasty. The majority of patients were male, and the highest proportion was in the age groups of 11-20 years and 21-30 years. Tympanic membrane examination revealed that most patients had subtotal perforations (35.14%), and audiometric examination showed conductive deafness in 68.42% of cases. The most common pathology observed in the tympanic cavity during surgery was granulation (69.74%), and type I tympanoplasty was the most frequently performed procedure (77.63%). The majority of tubal function tests showed patent results (56.58%), and Schuller plain radiographs commonly showed sclerotic findings (78.95%). Post-surgery, the majority of patients had dry ears (80.26%), exhibited good growth of eardrum grafts (76.32%), and experienced an improvement in hearing function (60.53%).

Conclusion: In this study, the eradication after surgery obtained dry ear conditions with good growth of eardrum grafts and increased hearing function in patients with safe type CSOM after CWU Tympanoplasty.

Keywords: *chronic suppurative otitis media, safe type chonic suppurative otitis media, canal wall up surgery*

1. INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a condition marked by chronic inflammation of the middle ear mucosa and mastoid cavity. It is characterized by the perforation of the tympanic membrane and a history of ear canal discharge (otorrhea) for over two months, either continuously or intermittently, with discharge appearing clear or in the form of pus.[1,2] According to the World Health Organization (WHO), CSOM is a global disease affecting 65-330 million people, with 60% of them experiencing hearing loss.[3] The condition is primarily caused by aerobic bacteria such as Pseudomonas aeruginosa, Escherichia coli, S. aureus, Streptococcus pyogenes, Proteus mirabilis, Klebsiella species, or anaerobes like Bacteroides, Peptostreptococcus, and Proprionibacterium.[3] CSOM can be categorized into two types: safe type (mucosal or benign) and dangerous type (bone or malignant).[4]

In the safe type, cholesteatoma is absent, leading to rare complications. The treatment goal for CSOM is to eliminate the disease by removing pathological tissue, preventing complications, and eventually improving hearing loss.[2] Treatment for the safe type of CSOM includes both non-surgical and surgical approaches. Non-surgical therapies involve ear toilet,

antibiotic usage, and symptomatic management. Surgical intervention, on the other hand, involves canal wall up tympanoplasty (CWU), which aims to enhance middle ear aeration while preserving the posterior meatal wall.[5]

CWU tympanoplasty surgery involves the removal of pathological tissue from the mastoid and tympanic cavities, thereby improving middle ear function. The procedure also focuses on reconstructing the ossicle chain and closing tympanic membrane perforations to enhance the mechanical delivery of sound waves. Tympanoplasty is classified into five types according to Wulstein.[6]

Postoperative care following CWU tympanoplasty requires careful attention from both the surgeon and the patient, with emphasis on wound hygiene and tamponade removal on second week. Surgical outcomes are typically evaluated 3-4 months after the procedure. The success of CWU tympanoplasty depends on various factors, including patient characteristics (age, sex, perforation type, Eustachian tube function, and acquired pathology), surgeon expertise, available equipment, and postoperative care quality.[7]

This reference aims to present the profile of safe type CSOM patients who underwent CWU tympanoplasty at ORL-HNS outpatient Dr. Soetomo General Academic Hospital Surabaya. The information encompasses basic, clinical, and supporting data. It is anticipated that this research will contribute valuable insights into the characteristics of patients with safe type CSOM who have undergone surgical intervention.

2. METHODS

The research employed a retrospective descriptive research design utilizing medical record data from the otology division of ORL-HNS outpatient, Dr. Soetomo General Academic Hospital Surabaya. The study encompassed all patients with safe-type CSOM who underwent CWU tympanoplasty surgery between January 2018 and December 2020 at Dr. Sutomo Surabaya. The sample for this study consisted of medical record data from patients meeting the defined inclusion and exclusion criteria. Inclusion criteria involved medical record data containing information about patients diagnosed with safe-type CSOM who underwent CWU tympanoplasty surgery at Dr. Sutomo Surabaya. Exclusion criteria encompassed patients with safe-type CSOM who underwent revision surgery, those with unrecorded audiogram results in their medical records, and those who did not undergo tubal function tests due to unavailable equipment.

The collected medical record data included basic information such as age, gender, place of residence, education level, and occupation. Additionally, clinical and supportive data were gathered, including perforation type, audiometry results, tubal function test outcomes, Schuller plain xrays, tympanic cavity pathology, tympanoplasty type, and postoperative eradication results. The assessment of surgical success was conducted during postoperative patient follow-up and documented in the medical records. Subsequently, all collected data was processed and organized using computer-based tabulation.

This research was conducted in compliance with an established research protocol and received approval from the Health Research Ethics Committee of Dr. Soetomo Hospital, Faculty of Medicine, Airlangga University, Surabaya.

3. RESULT

Between January 2018 and December 2020, the medical records at ORL-HNS outpatient Dr. Soetomo General Academic Hospital Surabaya revealed the presence of 287 patients diagnosed with safe-type CSOM. Out of these, 138 patients had been diagnosed with the safe type of CSOM and had subsequently undergone CWU tympanoplasty surgery. After meticulously applying the inclusion and exclusion criteria, a refined sample size of 76 patients was obtained, constituting those that adhered to the predetermined criteria

Table 1. Distribution and frequency based on gender, age, recidency, occupation

Characteristics		n	Percentage (%)
Gender	Male	39	51.32
	Female	37	48.68
Age group	< 10	2	2.99
	11-20	22	29.73
	21-30	22	29.73
	31-40	13	17.57
	41-50	8	10.81
	51-60	9	12.16

Residency	Surabaya	23	30.26
	Outside Surabaya	53	69.74
Educational Degree	Elementary School	9	11.84
	Junior High School	6	7.89
	Senior High School	41	53.95
	Bachelor's Degree	20	26.32
Occupation	Civil Worker	5	6.58
	Private Employee	29	38.16
	Unemployed	42	55.26

Table 1 presents the distribution of CSOM patients who underwent CWU tympanoplasty surgery, with 39 male patients (51.32%) and 37 female patients (48.68%). The prominent age groups among CSOM patients who underwent tympanoplasty were 11 to 20 years and 21 to 30 years, both comprising 22 patients (29.73%). The range of patients' ages spanned from 5 to 73 years, with the youngest patient being 5 years old and the oldest, 73 years. The majority of patients seeking treatment hailed from outside Surabaya, constituting 69.74% of the total. In terms of education, high school graduates accounted for the highest proportion (53.95%), while in employment status, the majority were not working (55.26%).

Table 2. Distribution of clinical data of perforation types and types of hearing impairment.

Characteristics	n	Percentage (%)
Type of Perforation		
Central	23	30.36
Subtotal	27	35.53
Total	26	34.21
Type of Hearing Loss		
Conductive	52	68.42
Sensorineural	0	0.00
Mixed	24	31.58

Table 2 illustrates the prevalent type of perforation observed among CSOM patients of the safe type who underwent tympanoplasty: the subtotal type was the most common, with 27 patients (35.53%). Conduction deafness emerged as the predominant type of hearing loss, affecting 52 patients (68.42%).

Table 3. Distribution and Frequency of Supporting Examinations for Eustachian Tube Function Tests and Schuller Mastoid Plain xrays

Characteristics	n	Percentage (%)
Eustachian tube function test		
Patent	43	56.58
Not patented	27	35.53
Partial	6	7.89
Schuller mastoid plain xrays		
Sclerotic	60	78.95%

Diploic	11	14.47%
Pneumatic	5	6.58%

Table 3 displays the supporting findings from tubal function tests conducted on safe-type CSOM patients who underwent tympanoplasty. The majority of cases exhibited patent results, totaling 43 patients (56.58%). In the evaluation of Schuller mastoid plain xrays, the most frequently observed presentation was a sclerotic appearance, noted in 60 cases (78.95%).

Table 4. Distribution and Frequency of Tympanic Cavity Pathology

Characteristics	n	Percentage (%)
Tympanic Cavity Pathology		
Granulation	53	69.74
Mucosal thickening	4	5.26
Tympanosclerosis	4	5.26
Granulation + hypertrophy	9	11.84
Granulation + tympanosclerosis	6	7.89
Tympanoplasty type		
Type I	59	77.63
Type II	5	6.58
Type III	7	9.21
Type IV	4	5.26
Type V	1	1.32

Table 4 outlines the prevailing type of tympanic cavity pathology identified in safe-type CSOM patients who underwent tympanoplasty surgery: granulation tissue was the most common, affecting 53 patients (69.74%). Among the various tympanoplasty types, type I was the predominant choice in this study, performed on 59 patients (77.63%).

Table 5. Characteristics of CWU Tympanoplasty Surgery Results in Safe-Type CSOM Patients

Characteristics	n	Percentage (%)
Postoperative eradication results		
Dry	61	80.26
Wet	15	19.74
Growth of the eardrum graft		
Growth	58	76.32
Failed	18	23.68
Postoperative audiometry		
Improved	46	60.53
Constant	23	30.26
Worsened	7	9.21

Table 5 provides an overview of the eradication outcomes following CWU tympanoplasty surgery. The majority of cases

exhibited dry ear conditions, noted in 61 patients (80.26%). Additionally, a significant proportion of patients demonstrated positive growth of eardrum grafts (76.32%), and the majority experienced improved postoperative audiometric evaluations (60.53%).

4. DISCUSSION

Regarding the basic data in this study, it was observed that patients with the safe type of CSOM who underwent CWU tympanoplasty surgery were more commonly male (51.32%) compared to female (48.68%). This observation aligns with a study by Rahayu et al., where out of 60 CSOM patients who underwent tympanoplasty surgery, a higher proportion were males (53.3%) than females (46.7%).[8] Similarly, another study by Debora et al., on CSOM patients at Haji Adam Malik Hospital in Medan reported a similar trend, with 82 male patients (63.1%) outnumbering the 48 female patients (36.9%).[9] Meanwhile, Indorewala et al., in their research, mentioned that while the sex distribution tendency remains uncertain, men exhibit a lower awareness level of the disease compared to women, potentially contributing to their higher infection rates.[10]

As for the age distribution, this study found that the majority of patients fell within the productive age groups of 11-20 years and 21-30 years, each accounting for 22 patients (29.73%). This trend is consistent with Gupta et al.'s findings, where the highest number of CSOM patients were in the 11-20 year age group (36.56%), followed by the 21-30 year age group (20.32%).[11] Indorewala et al. also reported similar results, identifying the 31-45 year age group as the largest among CSOM patients undergoing tympanoplasty (33.3%), followed by the 15-30 year age group (29.6%).[10] These studies collectively emphasize that CSOM tends to manifest in the early decades and typically results from recurrent acute otitis media during childhood, rarely occurring in adults. The anatomical characteristics of the Eustachian tube, with its flat position and short size, facilitate middle ear infections. Prolonged infections can lead to mastoid sclerosis and reduced mastoid process size.[8]

In terms of patient origin, the majority of safe-type CSOM patients seeking treatment at the ORL-HNS outpatient in Dr. Soetomo General Academic Hospital Surabaya came from areas outside Surabaya, constituting 69.74% of the total, while 30.26% were local patients. This pattern resembles Gupta et al.'s study, which showed fewer CSOM patients seeking treatment from urban areas (34.96%) compared to rural areas (65.04%).[11] Akhtar et al. reported similar results, with safe-type CSOM patients at Faisalabad Pakistan Hospital mainly originating from rural (57.2%) rather than urban (42.8%) areas. Factors such as economic conditions, inadequate sanitation, and limited healthcare facilities often hinder proper treatment.[11,12]

Examining the type of perforation among CSOM patients undergoing tympanoplasty surgery, the results from Table 2 indicate that the most common types were subtotal perforations (35.53%), followed by total perforations (34.21%) and central perforations (30.36%). This trend aligns with Rahayu et al.'s study, which identified subtotal perforations (78.3%) as the highest, followed by total perforations (21.7%) at Sanglah General Hospital Denpasar.[8] Similarly, Akhtar et al. reported that the most prevalent type of perforation in tubotympanic CSOM patients was the subtotal type (39.2%), followed by the inferior central type (27.2%), anterior central type (24.3%), and posterior central type (9.3%).[12] Perforations result from factor s such as middle ear mucosa edema, superficial epithelial cell destruction, and purulent exudate formation, leading to increased pressure and subsequent membrane damage.[12]

In this study, the predominant type of hearing loss was conduction deafness (68.42%), followed by mixed deafness (30.26%). These outcomes align with the research by Deviana et al., which reported similar distribution of hearing loss among 118 participants, predominantly conduction deafness (61.17%), followed by mixed deafness (23.73%), sensorineural deafness (5.85%), and a small fraction of normal hearing (4.26%).[13] Moruskar et al. also yielded similar results, indicating a predominance of conduction deafness (82%) among CSOM patients of the safe type. [14] Conduction deafness, characterized by varying degrees of hearing loss, occurs due to impediments in transmitting sound waves from the middle ear to the inner ear. The causes encompass tympanic membrane perforation, ossicle damage, cholesteatoma, middle ear mucosa infection, and inflammation.[13] Chronic middle ear infections lead to ear edema, secretion formation, and ossicular chain damage.[15] Furthermore, Deviana et al.'s research identified age-related sensorineural hearing loss in 5.85% of patients. This was associated with CSOM's duration, leading to an increase in pure tone and bone hearing thresholds due to inflammatory mediators penetrating the inner ear, causing cochlear hair cell loss and damage.[14,15]

The results from Table 3 display that the most common Eustachian tube function test outcome was patent tubes (56.58%). This outcome contrasts with the study conducted by Sunitha et al., which reported partial Eustachian tube function (43%) as most prevalent among safe-type CSOM patients, followed by patent (30%) and non-patent (27%) function.[16] Eustachian tube function involves maintaining pressure equilibrium between the tympanic cavity and outside air, facilitating secretion drainage, and preventing nasopharyngeal secretions from entering the tympanic cavity. Estachius Tube Function test (ETF) evaluates Eustachian tube abilities by assessing middle ear pressure at rest, and variations in results may arise from differences in ETF methodology.[17]

In this study, Schuller mastoid plain xrays exhibited predominantly sclerotic images (78.95%), followed by diploic (14.47%) and pneumatic (6.58%) images. Mahdiani et al.'s study involving 600 CSOM patients produced similar results, where sclerotic images constituted the highest proportion (65%).[18] The Schuller projection remains a valuable method to assess

temporal bone condition, revealing mastoid pneumatization extent and structures. Chronic re-infections hinder mastoid cell development, leading to small and dense (sclerotic) mastoid size.[2]

Pathologically, the tympanic cavity in this study showed a prevalence of granulation tissue (69.74%), as presented in Table 4. This finding differs from Sharma et al.'s research, which identified mucosal thickening (33.3%) as the most common pathology, followed by tympanosclerosis (19%).[19] The inflammatory process in the middle ear triggers mucosal ulceration and pus formation, culminating in granulation. Prolonged granulation can result in bone damage and complications.[19]

Tympanoplasty, aimed at enhancing middle ear aeration and sound wave mechanical delivery, is classified according to Zollner and Wullstein. In this study, the majority of tympanoplasty procedures were classified as type I tympanoplasty (77.63%). These findings correspond to Antony et al.'s research cited by Janitra et al., which reported a predominance of type I tympanoplasty (60%). [20] Wullstein's classification, comprising five types, designates type I as a procedure confined to the tympanic membrane without ossicle manipulation. This most frequently performed procedure demonstrates high success rates.[6]

The assessment of CWU tympanoplasty surgery outcomes was done three months post-surgery. As shown in Table 5, the majority of cases indicated dry conditions (80.26%). Post-surgery, 76.32% of ear drum grafts demonstrated growth, while 23.68% did not. These findings align with a study conducted by Singh et al. in India, which evaluated postoperative ear drum graft growth in 416 patients after three months, with 83.2% exhibiting growth and 16.8% showing no growth.[21] Similarly, Kumar et al. reported corresponding results of 80% ear drum graft growth and 20% no growth.[22] In the context of CSOM surgery, the primary objective is to eliminate the source of infection. Consequently, favorable outcomes at postoperative evaluation include a dry ear condition and robust ear drum growth. Studies indicate that various factors, such as age, perforation size and location, preoperative ear condition, and intraoperative tympanic cavity condition, influence ear drum graft growth.

Evaluating patients' hearing function before and after surgery through audiometry revealed a 60.53% improvement or hearing function increase, followed by a 30.26% achievement of permanent hearing function, and a 9.21% decrease in hearing function. These results correspond with findings from Olusesi et al., where 88.2% experienced improved hearing function, and Ogisi et al., cited by Indorewala et al., reported a 77% increase in hearing function.[10] Mahdiani et al.'s research yielded similar outcomes, indicating a 68.5% hearing function increase, 26.5% permanent hearing function, and 5% decreased hearing function.[18] The elevation in hearing threshold is influenced by multiple factors, including the surgeon's expertise during the procedure and the pre- and post-surgery pathological conditions within the middle ear.[8]

5. CONCLUSION

The profile of CSOM patients with the safe type who underwent CWU tympanoplasty at ORL-HNS outpatient Dr. Soetomo General Academic Hospital Surabaya comprised 76 individuals. The majority were male, and the largest age groups were within the 11-20 and 21-30 year ranges. Patients primarily originated from outside Surabaya, often with a high school education level and unemployed status. Tympanic membrane examination revealed subtotal perforations as the most prevalent (35.14%), and audiometric testing identified conduction deafness as the predominant hearing impairment (68.42%). During surgical assessment, the most common tympanic cavity pathology was granulation tissue (69.74%), while type I tympanoplasty was the prevailing procedure performed (77.63%). Notably, the tubal function tests exhibited a frequent patent result (56.58%), and Schuller plain radiographs commonly showed sclerotic images (78.95%). Following surgery, eradication results displayed dry ear conditions (80.26%), robust eardrum graft growth (76.32%), and a noteworthy enhancement in hearing function (60.53%).

Suggestion

This basic data can be used as a reference for future CSOM research to see the profile of CSOM patients who underwent surgery

Disclosure

The author stated there is no conflict of interest of this research

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