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Characteristics of Chronic Suppurative Otitis Media (CSOM) patients who underwent tympanoplasty surgery at Sanglah General Hospital for the period 2017 - 2019



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ABSTRACT

Background: One way to deal with deafness from Chronic Suppurative Otitis Media (CSOM) is middle ear reconstruction surgery known as tympanoplasty. The success of surgery is when complete eradication of the disease is possible as well as hearing improvement. This study aims to evaluate the characteristics of chronic suppurative otitis media patients who underwent tympanoplasty surgery at Sanglah General Hospital for the period 2017 – 2019.

Methods: A retrospective descriptive study was conducted through secondary data from the medical records of CSOM patients who had undergone tympanoplasty surgery at Sanglah General Hospital in Denpasar during the January 2017 - December 2019 period. Variables assessed in this study were age, sex, address of residence, infected side, perforation surface area, CT-scan, culture, surgical findings, graft type and antibiotic therapy, post tympanoplasty tympanic membrane perforation condition, audiometry results before and after undergoing tympanoplasty. Data were analyzed using SPSS version 20 for Windows.

Results: Most of the respondents were male (53.3%), aged 46 - 55

years (26.7%), and living in Denpasar (30.0%). Based on the ear side, the most infected were unilateral (53.3%) and the subtotal perforation surface area (78.3%). No visible abnormalities (40.0%) were the most cases on the CT-Scan, following by the *Pseudomonas aeruginosa* (21.7%) infection and surgical findings in the form of tympanic membrane perforation only (55.0%). Based on the 3 months post tympanoplasty condition, it was found that the perforation had closed (83.3%), normal audiometric results (38.3%), and a degree of improvement in the hearing threshold after undergoing tympanoplasty was found to be mostly 5-10 dB (48.3%).

Conclusion: CSOM patients who underwent tympanoplasty surgery were mostly men, aged 46-55 years, unilateral, subtotal perforation, and no CT scan abnormalities. In comparison, the membrane perforation condition 3 months post tympanoplasty was closed, mild deafness before tympanoplasty, normal degree of deafness after tympanoplasty, and the average mean hearing threshold improvement was 5 - 10 dB.

Keywords: Characteristics, Chronic Suppurative Otitis Media, Tympanoplasty

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INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a chronic inflammation of the middle ear mucosa with tympanic membrane perforation and a history of discharge from the middle ear for more than 2 months, either continuous or intermittent, and the secretions can be mucous or mucopurulent.¹ CSOM in Indonesian society is known as “congkek”, neglected or watery ears. Most people with CSOM consider this disease to be a common disease that will heal itself later. This disease is generally painless unless complications have occurred.^{1,2}

CSOM is one of the main health problems found in many populations globally and is a cause of significant morbidity and mortality.³ This disease is commonly found in the lower middle

class in developing countries and causes increased treatment costs.^{2,3} WHO in 2004 stated that CSOM affects 65-330 million people worldwide, of which 60% have hearing loss.⁴ The prevalence of CSOM worldwide is in the range of 1-46%. In developing countries, the incidence of CSOM is relatively high, namely around 5-10%, while in developed countries, it is 1%.⁴ According to the health survey of sight and hearing senses conducted by the Ministry of Health in 1996, the prevalence of CSOM in Indonesia is as much as 3.1% population and in 2007 increased by 5.4%.⁵

One of the sequelae of CSOM, which often causes problems, is a persistent perforation of the tympanic membrane.¹ The impact of the perforation causes a decrease in hearing acuity and interferes with communication. Recurrent

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infections are also very disturbing to the patient's psychosocial condition, the more frequent repeated infections, the more extensive the middle ear tissue damage, and the more severe the hearing damage that occurs.^{3,4} Hearing loss is one of the biggest obstacles in the ability to communicate effectively. This shows that health problems with the sense of hearing are important to get an immediate and integrated treatment

One way to deal with deafness that occurs due to CSOM is middle ear reconstruction surgery known as tympanoplasty, a surgical procedure to remove the pathological process in the tympanic cavity followed by voice reconstruction, accompanied or without tympanic membrane striking.³ The main tympanoplasty principles are creating an intact tympanic membrane, preventing recurrence of watery ears, and restoring hearing function.^{6,7} The success of surgery is when complete eradication of the disease is possible, as well as hearing improvement. Hearing can be said to improve after hearing reconstruction if you find an improvement in the hearing threshold of more than 15 dB, which can be measured by pure tone audiometry.⁸ Based on those mentioned above, this study aims to determine the characteristics of Chronic Suppurative Otitis Media (CSOM) patients who underwent tympanoplasty surgery at Sanglah General Hospital for the period 2017 – 2019.

METHODS

This study used a retrospective descriptive research design by taking secondary data from the medical records of CSOM patients who had undergone tympanoplasty surgery at Sanglah General Hospital, Denpasar, from January 2017-December 2019. The inclusion criteria were all CSOM patients who had undergone tympanoplasty surgery at Sanglah General Hospital, period 2018-2019. Exclusion criteria were CSOM patients with incomplete medical records. Data collected were age, sex, address of residence, infected side, perforation surface area, CT-scan, culture, surgical findings, graft type and antibiotic therapy, post tympanoplasty tympanic membrane perforation condition, audiometry results before and after undergoing tympanoplasty. Data were analyzed using SPSS version 20 for Windows.

RESULTS

Based on gender, there were 32 males (53.3%) and 28 females (46.7%) (Table 1). Most of the respondents were 46-55 years old (26.7%), followed by 36-45 years old (25.0%), and the average age of CSOM patients who underwent tympanoplasty

was 35.32 ± 15.65 years old (Table 1). According to the patient's residence, most of the respondents were living in Denpasar regency (30.0%), followed by Badung Regency (23.0%), and Karangasem Regency (13.3%) (Table 1). Unilateral infected ear (53.3%), subtotal perforation surface area (78.3%), no visible abnormalities in the middle ear on CT-Scan (40.0%), no culture performed (51.7%), and the findings of tympanic membrane perforation were also several predominant variables in this study (Table 1).

In Table 2, tragus cartilage as the graft type used in this study was predominant (93.3%). In addition, levofloxacin antibiotic usage (25.0%), closed tympanic membrane in post-tympanoplasty condition (83.3%), a mild degree of pre-tympanoplasty deafness (40.0%), normal degree of post-tympanoplasty deafness (38.3%), and 5-10 dB mean hearing threshold in post-tympanoplasty (48.3%) were predominant in this study (Table 2). Besides, the mean hearing threshold in pre-tympanoplasty was 42.71 ± 14.16 dB, followed by 31.18 ± 14.31 dB in post-tympanoplasty, and average hearing threshold improvement was 11.52 ± 5.48 dB (Table 2).

DISCUSSION

In this study, it was found that the number of CSOM sufferers who underwent tympanoplasty surgery was more in men than women, namely 32 men (53.3%) and 28 women (46.7%), respectively. This is in accordance with a study conducted by Srivastava A et al. found the highest incidence of CSOM patients in males compared to females, namely 56.3% and 43.7% of 110 patients.⁹ Asroel HA et al. stated that the incidence of CSOM was more common in males as many as 55.78% and women 46.22% but not significantly different.¹⁰ An episode of *S. pneumoniae* infection within the first year of life is associated with recurrent episodes of acute otitis media.¹⁰ This condition is more often found in boys than girls

This study's most age group was 46-55 years (26.7%) and followed by the 36-45 year age group (25.0%) with a mean age of 35.32 ± 15.65 years. This is not much different from the results of research conducted at Adam Malik Hospital Medan, where the most age group of CSOM patients who underwent surgery was in the 31-40 year age group (28.9%).¹⁰ In a study conducted by Shetty S, of 50 cases CSOM who underwent tympanoplasty, the age group 11-30 years was the highest (80%) with an average age of 23.58 years.¹¹ The study states that CSOM tends to occur more frequently in the early decades of life and can leave permanent perforations.¹¹ The incidence of CSOM

Table 1. Distribution of CSOM patients who underwent tympanoplasty surgery based on gender, age, residence, site of the infected ear, perforation surface area, CT-Scan, culture results, and operating findings

Variables	Respondents (N=60)	Percentage (%)	Mean±SD
Gender			
Male	32	53.3	
Female	28	46.7	
Age (Years)			35.32±15.65
0-5	1	1.7	
6-11	4	6.7	
12-16	4	6.7	
17-25	10	16.7	
26-35	7	11.7	
36-45	15	25.0	
46-55	16	26.7	
56-65	2	3.3	
>65	1	1.7	
Residence			
Denpasar	18	30.0	
Badung	14	23.0	
Gianyar	3	5.0	
Karangasem	8	13.3	
Buleleng	4	6.7	
Bangli	4	6.7	
Tabanan	2	3.3	
Jembrana	1	1.7	
Klungkung	0	0.0	
Others	6	10.1	
Site of Infected Ear			
Unilateral	32	53.3	
Bilateral	28	46.7	
Perforation Surface Area			
Subtotal	47	78.3	
Total	13	21.7	
CT-Scan			
No visible abnormalities in the middle ear	24	40.0	
Chronic Mastoiditis	20	33.3	
Mastoiditis + tissue granulation MAE	4	6.7	
Mastoiditis + air cell mastoid destruction	5	8.3	
Mastoiditis + otitis media	4	6.7	
Reduce air cell mastoid	2	3.3	
Thickness of tympanic membrane	1	1.7	
Culture Results			
Pseudomonas aeruginosa	13	21.7	
Staphylococcus coagulase negative	4	6.7	
Staphylococcus haemolyticus	1	1.7	
Staphylococcus aureus	1	1.7	
Methicillin Resistant Staphylococcus aureus	1	1.7	
Sphingomonas paucimobilis	1	1.7	
Bordetella hinzii	1	1.7	
Escherichia coli	1	1.7	
No growth	6	10.0	
No culture	31	51.7	
Operating Findings			
Tympanic membrane perforation	33	55.0	
Tympanic membrane perforation + tympanosclerotic	11	18.3	
Tympanic membrane perforation + tissue granulation	10	16.7	
Tympanic membrane perforation + mucosal thickening of the tympanic cavity	6	10.0	

Tabel 2. The characteristics of CSOM patients who underwent tympanoplasty surgery based on the type of graft used during tympanoplasty, the antibiotic therapy administration, condition of post tympanoplasty tympanic membrane perforation, and the evaluation of pre and post tympanoplasty audiometry

Variables	Respondents (N=60)	Percentage (%)	Mean±SD
Graft Type			
Tragus cartilage	56	93.3	
Temporalis fascia	3	5.0	
Tragus cartilage + Temporalis fascia	1	1.7	
Antibiotic Therapy			
Levofloxacin	15	25.0	
Ciprofloxacin	5	8.3	
Cefixime	6	10.0	
Erythromycin/Azithromycin	3	5.0	
Ofloxacin ear drops	6	10.0	
Ofloxacin ear drops + Levofloxacin	7	11.7	
Ofloxacin ear drops + Ciprofloxacin	2	3.3	
Ofloxacin ear drops + Cefixime	4	6.7	
Ofloxacin ear drops + Cefadroxyl	3	5.0	
Ofloxacin ear drops + Azithromycin	1	1.7	
Ofloxacin ear drops + Levofloxacin + Cefixime	6	10.0	
Ofloxacin ear drops + Levofloxacin + tetracyclines	2	3.3	
Post tympanoplasty condition			
Closed tympanic membrane	50	83.3	
Open tympanic membrane	10	16.7	
Degree of Deafness (Pre-Tympanoplasty)			
Normal (0 – 25 dB)	5	8.3	
Mild (26 – 40 dB)	24	40.0	
Moderate (41 – 55 dB)	21	35.0	
Moderate – Severe (56 – 70 dB)	7	11.7	
Severe (71 – 90 dB)	3	5.0	
Very Severe (> 90 dB)	0	0.0	
Mean hearing threshold of Pre-Tympanoplasty (dB)			42.71±14.16
Degree of Deafness (Post-Tympanoplasty)			
Normal (0 – 25 dB)	23	38.3	
Mild (26 – 40 dB)	21	35.0	
Moderate (41 – 55 dB)	13	21.7	
Moderate – Severe (56 – 70 dB)	2	3.3	
Severe (71 – 90 dB)	1	1.7	
Very Severe (> 90 dB)	0	0.0	
Mean hearing threshold of Post-Tympanoplasty (dB)			31.18±14.31
Post-Tympanoplasty classification of mean hearing threshold (dB)			
0 – 5			
5 – 10	5	8.3	
10 – 15	29	48.3	
> 15	12	20.0	
Average hearing threshold improvement (dB)	14	23.3	
			11.52±5.48

almost always begins with recurrent otitis media in children, rarely starting after adulthood. It could be caused by the location and size of the eustachian tube, which is shorter and flatter, so it is easy to get middle ear infections. Besides, the immunological function of children who are still low contributes to the emergence of recurrent otitis media. Infection factors usually come from the nasopharynx, such as adenoiditis, tonsillitis, rhinitis, and sinusitis.¹⁰

In this study, it was found that the most sufferers resided in Denpasar, namely 18 people (30%). Denpasar City is the capital city of Bali Province, Indonesia. According to data from the Bali Province BPS in 2019, Denpasar City is the area with the highest population. With a small area and a large population, Denpasar City is the region with the highest density, 7,282 people/km².¹² The dense population is one of the leading causes of the spread of CSOM. In addition to the population in the city of Denpasar, which is denser compared to other regencies, it is believed that the closer access to Sanglah General Hospital makes the number of CSOM sufferers residing in Denpasar in the highest position.

Most patients in this study experienced unilateral CSOM, namely 32 people (53.3%), while bilateral CSOM patients were 28 people (46.7%). This is in accordance with the study of Lisa AN and Wibawa FS who obtained 155 unilateral CSOM (76%) and 50 (24%) bilateral CSOM.¹³ Srivastava A et al. Found that 24 people (60%) experienced unilateral CSOM and 16 people (40%) had bilateral CSOM.⁹ The cause of frequent unilateral middle ear infections is not known with certainty, but in a study conducted by Gustomo BS, it was found that the use of hands had an association with ear infections.¹⁴ The right unilateral ear is more frequently infected as a result of trauma due to the patient's habit of excessively picking the ear with the right hand so that the right ear is more often exposed.

Based on the examination results using otoscopy, 47 people (78.3%) had subtotal tympanic membrane perforation, and 13 people (21.7%) had total tympanic membrane perforation. This is in accordance with research conducted by Balasubramanian C et al., where the type of perforation obtained was subtotal perforation with 43%, followed by total perforation with 20%.¹⁵ However, this is not in accordance with research conducted by Asroel HA et al., which stated that the highest number of perforations was perforation. total with 65.17% followed by subtotal perforation with 31.46%.¹⁰

Of the 60 CSOM patients who underwent tympanoplasty, the highest number of CT-scans was found without abnormalities in the middle

ear (40.0%) and followed by chronic mastoiditis (33.3%). This result was different from the research at Soetomo Hospital Surabaya, which reported that chronic mastoiditis was the most common (72.26%).¹⁶ This is because if the chronic infection continues, the mastoid experiences a sclerotic process, resulting in a decrease in the size of the mastoid process.¹⁶

This study's most culture results were *Pseudomonas aeruginosa* (21.7%) followed by *Staphylococcus coagulase* (6.7%). This is in accordance with the research conducted by Malkappa SK et al., with the results of *P. aeruginosa* dominating by 45.24%.¹⁷ The same thing was shown in the study of Yeo et al., which obtained *P. aeruginosa* (31.8%), followed by MRSA (24.2%), MSSA (16.4%), and *coagulase-negative Staphylococcus* (11.8%).¹⁸ In the study by Asroel HA et al., Based on the germ pattern, *Pseudomonas aeruginosa* was found in the highest number of cultures (21.01%).¹⁰ In isolation from chronic otitis media, aerobic and anaerobic bacteria were involved in some cases. Aerobic bacteria often encountered are *Pseudomonas aeruginosa*, *Streptococcus aureus*, and gram-negative bacilli such as *Escherichia coli*, *Proteus sp*, and *Klebsiella sp*. Anaerobic germs such as *Bacteroides sp* and *Fusobacterium sp*. Furthermore, fungi can also be found, especially *Aspergillus sp* and *Candida sp*. It is a consideration that the fungus might overgrow after the use of antibiotic drops.²⁰ *P. aeruginosa* bacteria can grow well even without particular nutrients in the growing medium, proliferate at room temperature, and are very resistant to antibiotics, making it difficult to treat. These bacteria use the pills to attach to the necrotic or damaged middle ear epithelium. Pyocyanin, the pigment produced by these bacteria, can damage the middle ear's mucosa and cilia. Once attached to the epithelium, it will produce elastases and proteases, which are histotoxic and facilitate bacteria to further invade into the bloodstream.¹⁹

Based on the surgical findings in this study, only 33 people (55%) of tympanic membrane perforation were found (55%) followed by 11 (18.3%) tympanic membrane perforation, 10 (16.7%) tympanic membrane perforation + granulation tissue, and tympanic membrane perforation + mucosal thickening of the tympanic cavity as many as 6 people (10%). According to Yazdi AK et al., granulation tissue was found in 37.5% of CSOM cases.²⁰ From the study conducted by Sanjeev KT et al., granulation tissue was found in 55.23% of CSOM cases.²¹

Of the 60 CSOM patients who underwent tympanoplasty surgery in this study, 93.3% used tragus cartilage grafts. This is in accordance with

a study by Ocak E et al., among 179 patients who underwent tympanoplasty, 82 patients used fascial grafts, and 97 patients used cartilage grafts.²² The study revealed no significant difference in overall graft success.²² In a systematic literature review, Mohamad SH et al. Found that tympanoplasty using temporalis fascial and cartilage grafts showed similar and comparable functional outcomes (hearing enhancement). The morphological findings (intact tympanic membrane) were found better using cartilage graft, with or without perichondrium. According to the same study, the use of cartilage grafts is a safe option for tympanic membrane reconstruction in both adults and children.²³

Oral antibiotic therapy is mostly given in the antibiotic Levofloxacin, accounting for 25.0% of the total patients. While the topical antibiotic that is mainly given is Ofloxacin drops, either given alone or in combination with oral antibiotics. Levofloxacin and Ofloxacin are antibiotics for the quinolone group. A study conducted by Mittal R et al., stated that antibiotic drops combined with aural toilets are the mainstay of therapy for CSOM and have been shown to be the most effective in randomized controlled trials.²⁴ Quinolones are the topical antibiotics most commonly used in the United States because of their proven effectiveness. Topical quinolones have a low side effect profile and are superior to aminoglycosides. Quinolones are highly effective against *P. aeruginosa* and do not have the potential side effects of cochleotoxicity and vestibulotoxicity, which are associated with aminoglycosides.²⁴

The tympanic membrane condition 3 months post tympanoplasty found that 50 people (83.3%) closed the tympanic membrane. Meanwhile, in the study conducted by Ocak E et al., in 179 patients who underwent tympanoplasty, the graft was closed in 82.9% of the fascia group and 86.5% in the cartilage group.²² In this comparative study, the use of cartilage grafts demonstrated better auditory and anatomical outcomes than the single use of fascia in tympanoplasty for both primary and revised cases.²²

In this study, based on the degree of deafness of CSOM sufferers before undergoing tympanoplasty, it was found that 24 people (40%) experienced mild deafness (26-40 dB). Meanwhile, after undergoing tympanoplasty, the most audiometry results showed normal hearing (<25dB), namely 23 people (38.2%). This is not in accordance with the research conducted by Kabdwal N et al., where the highest audiometric results were normal (<25dB) as much as 45.90% and mild deafness (26-40 dB) as much as 37.70% in safe type CSOM before tympanoplasty.²⁵

The mean pre and post tympanoplasty hearing

thresholds of 60 CSOM patients who underwent tympanoplasty was 42.71 ± 14.16 dB and 31.18 ± 14.31 dB, respectively. Kabdwal N et al., found that the preoperative mean hearing threshold of patients who underwent tympanoplasty was 31.98, while the postoperative average was 24.18 dB.²⁵ Research by Hayati R et al., stated that there was a statistically significant difference in the pre and post tympanoplasty hearing thresholds, with the mean (SD) pre-operation was 48.63 ± 18.82 dB while post-operation was 41.72 ± 18.88 dB ($p=0.001$).²⁶

The degree of improvement in the hearing threshold of CSOM patients after undergoing tympanoplasty surgery was found to have experienced the most improvement by 5 - 10 dB as many as 29 people (48.3%). A study by Hayati R et al., found that the hearing threshold improvement was mostly 0-5 dB, namely 12 people (57.1%).²⁶ Kabdwal N et al., found that the hearing threshold was 7.8 dB. Then after 6 months post-surgery, the hearing threshold was measured again, and the result was an improvement in the mean hearing threshold of 10.27 dB.²⁵ A study by Ocak E et al., in 179 patients who underwent tympanoplasty, hearing improvement was obtained in 79.2% of the fascia group and 85.5 % in the cartilage group.²²

In this study, the average hearing threshold improvement after undergoing tympanoplasty surgery was 11.52 ± 5.48 SD (dB). Research conducted by Batni G found that the average hearing threshold improvement after undergoing tympanoplasty surgery was 14.55 ± 9.40 dB.²⁷ While Sachin's research showed an improvement in the average hearing threshold of 25.25 ± 8.43 dB.²⁸ Changes in hearing thresholds are influenced by quite a lot of factors, especially on the ability of surgical techniques and pathological conditions pre and post-surgery that occur in the middle ear.²⁵

CONCLUSION

CSOM patients who underwent tympanoplasty surgery were mostly men, aged 46-55 years, unilateral, subtotal perforation, and no CT scan abnormalities. Besides, our study also found that the condition of the membrane perforation 3 months post tympanoplasty was closed, followed by mild deafness before tympanoplasty, normal after tympanoplasty, and the degree of repair threshold was 5 - 10 dB.

ETHICS CONSIDERATION

This study has obtained an Ethics Approval issued by the Research Ethics Committee of the Faculty of Medicine, Udayana University, on August 3, 2020.

CONFLICT OF INTEREST

There was no competing interest regarding the study.

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AUTHOR CONTRIBUTION

All of the authors equally contribute to the study from the conceptual framework, data gathering, and data analysis until reporting the study results through publication.

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