Pre and intraoperative findings of chronic otitis media

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Abstract. Chronic otitis media (COM) is still highly prevalent in developing countries and often become main cause of deafness and morbid complication. Appropriate management may decrease the morbidity and mortality rate. The aim of the study are to evaluate preoperative and intraoperative finding among COM patients. A descriptive study was conducted at Mohammad Hoesin Hospital Palembang from April 2015 to April 2018. A secondary data was taken from medical records. A total of 252 patients were included in this study with the highest incidence was at 21-30 years old group (29.36 \%) with male predominance. The most frequent preoperative assessment were total perforation of tympanic membrane in 104 patients (41.26 \%), moderately severe mixed hearing loss in 61 patients (24.2\%), and mastoiditis with cholesteatoma in computed tomography (CT) finding in 158 patients (62.69 \%). In intraoperative finding, there were 202 patients (80.15 \%) with cholesteatoma whereas 103 patients (40.87 \%) with granulation tissue. Ossicular chain destruction were found in 141 patients (55.95 \%). Canal Wall Down Mastoidectomy (CWD) were performed in 190 patients (75.39 \%). The prevalence of COM with cholesteatoma at Mohammad Hoesin hospital is still high. Operative management using CWD technique is preferred in cases of COM with cholesteatoma.

1. Introduction

Otitis media is an infection and inflammation of the middle ear. Otitis media is a common disease and generally occurs in developing countries. A study showed that approximately 80\% had children already suffered otitis media at least one time in their first 3 years of age. Otitis media are divided into two types, acute and chronic. Acute otitis media is characterized by an acute inflammatory process, with symptoms of otalgia, fever, and ear discharge, whereas, chronic otitis media (COM) is characterized by persistent discharge from middle ear with perforated tympanic membrane for more than 3 months. COM involves 65-350 million individuals worldwide especially in developing countries. It is estimated that there are 31 million of new cases of COM each year. Mahdevan et al reported COM prevalence in Indonesia was 5.4\% and in Thailand, Philippines, Malaysia and Vietnam ranged from 2 to 4\% compared to 0.01-0.03/1000 cases in America. Anggraeni R et al reported 3.4\% out of 7005 children had COM in Indonesia [1–3].

COM is diagnosed by anamneses and physical examination. From anamneses, complaints of ear discharge accompanied by hearing loss, otalgia, tinnitus, and vertigo are obtained. Perforated tympanic membrane is shown on otoscopy examination and pocket retraction with granulation tissue could also be found. Radiology imaging with high resolution CT of temporal bone can provide information of ossicular chain, facial nerve, semicircular canal, and pathological tissue in the middle ear [4].
Management of COM is done conservatively with antibiotic ear drops and aural toilet. Operative management in COM is the final treatment when COM failed to respond to the conservative management, in cases of complication, such as facial nerve paresis, subperiosteal abscess, petrositis, sinus venous thrombosis, and other complications. There are two common surgical approaches in managing COM with or without cholesteatoma. These approaches are Canal Wall Up Mastoidectomy (CWU) and Canal Wall Down Mastoidectomy (CWD) [4,5].

Preoperative general characteristics, audiometry, imaging, and intraoperative findings in COM patients are varied. This study aimed to describe the preoperative and intraoperative finding in COM patients at Mohammad Hoesin Hospital Palembang.

2. Methods
This is a descriptive study using a secondary data of medical records of patients who underwent COM surgery in ENT department Mohammad Hoesin Hospital Palembang from April 2015 to April 2018. Data on age, sex, operated ear, otorrhea duration, perforation type, hearing loss type, computed tomography features, surgery type, intraoperative findings, cholesteatoma stage, ossicular condition, and duramater condition.

The inclusion criteria were all COM patients underwent surgery at the ENT Department of Mohammad Hoesin Hospital Palembang from April 2015 to April 2018. Exclusion criteria were COM patient who did not have a complete medical record data. All data were collected and presented in descriptive form of tables and diagrams.

3. Results
This study involved 252 patients consisting of 141 men and 111 women. The youngest age in this study was 5 years old, while the oldest age was 95 years old. The highest age group was 21-30 years old (29.36%) while the least was > 60 years old (1.59%) (see table 1).

A total of 114 patients (45.23%) underwent surgery on the right ear and 138 patients (54.76%) had surgery on the left ear. Based on the duration of otorrhea, it was found that most of the patients had been complaining of otorrhea for >5 years 100 patient (39.68%) and fewer patients had otorrhea over a period of >1 year to < 3 years 39 patients (15.47%). From the otoscopy, 104 patients (41.26%) with total perforation of tympanic membrane were the most frequent while only 1 patient (0.39%), with marginal type was the least.

From temporal bone CT, most of the patient had mastoiditis with cholesteatoma (62.69%). There were 23.01% with mastoiditis and 14.28% with sclerotic lesion (see figure 2). Based on audiometry results, the most common was moderately severe mixed hearing loss (24.2%). The least common was mild mixed hearing loss (0.79%) (see figure 1). Surgical procedures that were performed were Canal Wall Down mastoidectomy (CWD) in 190 patients (75.39%) and Canal Wall Up mastoidectomy (CWU) in 62 patients (24.61%) (see figure 3).

Intraoperatively, most of patients were found with cholesteatoma and granulation tissue in 103 patients (40.87%). Other intraoperative findings were cholesteatoma in 99 patients (39.28%), granulation tissue in 42 patients (16.67%), and without cholesteatoma and granulation tissue in 8 patients (3.18%). Based on Bluestone classification of cholesteatoma stages, there were 116 patients (57.42%) with stage 4 cholesteatoma was the most frequent. A total of 34 patients (13.49%) with duramater exposure (see table 2).

Intraoperatively, there were 141 patients (55.95%) with ossicular destruction and 111 patients (44.05%) with intact ossicular chain. Most of the patients presented with Austin Kartush D type (48.8%) while the least was B type (3.51%) (see figure 4).

4. Discussions
Total patients with COM underwent surgery at Mohammad Hoesin Palembang in the last 3 years were 252 patients. There were 141 (55.95%) male and 111 (44.04%) female. The highest age group was 21-30 years old (29.36%). Aquino et al found that male (639 cases or 66.6%) had COM with
cholesteatom more than female (321 cases or 33.4%), with the highest incidence was found in age
group of 31-45 years old (42.60%). On the contrary, Abdullah et al reported that COM is more
prevalent in female than male (37 and 26 cases) with average age of 31 years old. Kumari et al
reported the highest incidence of COM was found in male 994 cases (58.02%) while female were only
718 cases (41.98%), with the majority age group was 16-30 (646 patients) [5–7].

In this study, more surgeries were performed on the left ear (54.76%) with the otorrhea duration >5
years (39.68%). The most common type of perforated tympanic membrane was total perforation
(41.26%). Kolo et al found that the right ear operations are more common than the left ear with an
average duration of 6 years otorrhea. Thakur et al found that from 172 COM cases, the most common
were total perforation (50%), followed by subtotal perforation (43.6%) and small center perforation
(6.39%). Aquino et al conducted a study on 1146 patient of COM and found that the perforation is
most likely to occur were attic perforation (50%), followed by marginal perforation (13.7%), total
perforation (13.2%) and central perforation (13.3%) [1,6,8].

Table 1. General characteristics of COM patients underwent
surgery at Mohammad Hoesin Hospital Palembang.

| Variable                                      | N (%)  |
|----------------------------------------------|--------|
| Gender :                                     |        |
| Male                                         | 141 (55.95) |
| Female                                       | 111 (44.04) |
| Age :                                        |        |
| ≤ 10 y.o                                     | 13 (5.15) |
| 11 – 20 y.o                                  | 66 (26.11) |
| 21 – 30 y.o                                  | 74 (29.36) |
| 31 – 40 y.o                                  | 43 (17.06) |
| 41 – 50 y.o                                  | 27 (10.71) |
| 51 – 60 y.o                                  | 25 (9.92) |
| > 60                                         | 4 (1.59) |
| Operated Ear                                 |        |
| Right                                        | 114 (45.23) |
| Left                                         | 138 (54.76) |
| Otorrhea duration                            |        |
| > 3 months- ≤ 1 year                         | 67 (26.58) |
| > 1 year - ≤ 3 years                         | 46 (18.25) |
| > 3 years - ≤ 5 years                        | 100 (39.68) |
| > 5 years                                    |        |
| Tympamic membrane perforation type           |        |
| Total                                        | 104 (41.26) |
| Subtotal                                     | 66 (26.19) |
| Central                                      | 37 (14.68) |
| Attic                                        | 44 (17.46) |
| Marginal                                     | 1 (0.39) |

COM can cause hearing loss, most frequently is conductive hearing loss. The presence of tympanic
membrane perforation with ossicular chain destruction can cause conductive hearing loss over 50dB.
In this study, the most common types of hearing loss were conductive hearing loss (49.98%). In this
study we also found sensorineural hearing loss in 6.34% patients. Islam et al reported that most cases
of conductive hearing loss were found in 80.8% population, while the least was sensorineural hearing
loss (20.1%). Kaur et al, from 100 COM patients, reported 81% of conductive hearing loss and 19% of
mixed hearing loss. Viswanatha et al reported 16 COM patients (8%) had sensorineural hearing loss.
Sensorineural hearing loss can occur in people with COM because the toxin from the middle ear passes through a round window membrane to the inner ear causing damage to hair cells especially in basal cochlear [9–11].

![Hearing Loss Type and Degree](image)

**Figure 1.** Type and degree Hearing loss of COM patient underwent operation at Mohammad Hoesin Palembang

| Variable                          | N (%)     |
|----------------------------------|-----------|
| Findings :                       |           |
| Cholesteatoma                    | 99 (39.28)|
| Cholesteatoma + granulation      | 103 (40.87)|
| Granulation                      | 42 (16.67)|
| Without cholesteatoma and granulation tissue | 8 (3.18) |
| Cholesteatoma stage:             |           |
| I                                | 7 (3.46)  |
| II                               | 13 (6.43) |
| III                              | 61 (30.19)|
| IV                               | 116 (57.42)|
| V                                | 5 (2.47)  |
| VI                               | 0 (0)     |
| Duramater                        |           |
| Intact                           | 218 (86.50)|
| Exposed                          | 34 (13.49)|

Additional examinations used to evaluate COM, were plain X-ray, computed tomography (CT) and magnetic resonance imaging (MRI). However, CT is the gold standard imaging examination to diagnose COM. High resolution CT can provide information on the range of ossicular chain, facial nerve, semicircular canal, and pathological tissue in the middle ear. However, CT has not been able to
distinguish between cholesteatoma and other tissue such as granulation tissue, fibrous connective tissue, mucosal edema, and fluid effusion. Erosion in ossicular chain, tympanic tegment, labyrinth, and the lateral attic wall strongly indicated a cholesteatoma. Baylan et al reported the results of the sensitivity of CT to assess cholesteatoma was 91.9% with a specificity of 94.7%. Chatterjee et al study suggested that cholesteatoma can be accurately diagnosed by computed tomography, 167 cases with tissue mass, included cholesteatoma, in CT had the same result with the surgical findings. All patients in this study underwent computed tomography examination. Results of CT found 158 patients (62.69%) of mastoiditis with cholesteatoma. Cholesteatoma were found intraoperatively in 80.15% [4,12,13].

The aim of surgical treatment of COM with cholesteatoma is to eradicate the disease, to maintain the existing hearing function, and normal ear structure preservation. There are two types of surgical techniques used in COM with cholesteatoma, such as Canal Wall Down (CWD) and Canal Wall Up (CWU). CWD is a mastoidectomy procedure that is still preferred in COM in developing countries due to cholesteatoma. The advantages of CWD are superior access to middle ear, especially with broad cholesteatoma, rarely requires a second surgery, and the recurrence rate is considerably low. Abdullah et al stated that CWD is still the choice of COM surgery in Malaysia because the COM patients characterized with extensive cholesteatoma. Kuo et al reported the prevalence of recurrence of CWU were 9-70% while CWD were 5-17%. Azevedo et al reported that CWD were performed in 51.3% of COM patients and CWU in 48.7% patients. Second surgery was performed in 15% of CWD group and 57.9% in CWU group. In our study, CWD is the most frequently performed surgery technique (75.39%) due to high prevalence of cholesteatoma (80.15%) [4,5,14,15].

![Computed Tomography Findings](image)

**Figure 2.** Computed Tomography Findings in COM patient underwent operation at Mohammad Hoesin Hospital Palembang.

Cholesteatoma is a cyst lesion formed by abnormal accumulation of keratinized squamous epithelium in the middle ear, epitympanum, mastoid cavity, petrous apex, or temporal bone. Invasive cholesteatoma growth may cause destruction of the middle ear. Theories of the main pathogenesis of cholesteatoma included 1) Invagination (retraction pocket); 2) Invasion or epithelial migration; 3) Squamous metaplasia; 4) Papillary ingrowth of the hyperplasia. Bluestone classification furtherly classify cholesteatoma based on the location and the invasion. The classification consists of stage 1: Cholesteatoma is confined to the middle ear (hypoepitympanum and mesoepitympanum), without erosion of ossicular chain; Stage 2: Stage 1 but with erosion of one or more ossicles, stage 3: middle ear and mastoid gas cell system are involved without erosion of ossicles, stage 4: same as stage 3 but with erosion of one or more ossicles, stage 5: extensive cholesteatoma of the middle ear, mastoid, and other portions of the temporal bone, the extent of which in not totally accessible to surgical removal.
(e.g., medial to labyrinth), with one or more ossicles involved. Fistula of labyrinth may or may not be present, and stage 6: same as stage 5, but cholesteatoma extends beyond the temporal bone. Abdullah et al reported that 57% of the study population were found with cholesteatoma, 21% with cholesteatoma and granulation tissue, and 22% without both. In our study, there were 103 patients (40.87%) with cholesteatoma and granulation tissue, 99 patients (39.28%) with cholesteatoma, 42 patients (16.67%) with granulation tissue and 8 patients (3.18%) without both cholesteatoma and granulation tissue. The most commonly encountered cholesteatoma stage based on Blue-stone classification was stage IV (57.42%) [4,5,16].

Defects in the ossicular can be evaluated intraoperatively. The ossicular chain are classified by Austin-Kartush into 6 types: 1. Type O (M+ I+ S+): ossicular intact; 2. Type A (M+ S+): absent of incus with intact maleus and stapes; 3. Type B (M+ S-): absent of stapes and incus with intact maleus; 4. Type C (M- S+): absent of maleus and incus with intact stapes; 5. Type D (M- S-): absent of maleus, incus and stapes; 6. Type E: ossicular head fixation; 7 Type F: stapes fixation. In our study, ossicular chain destruction occurred in 141 patients (55.95%). Austin-Kartush type D was the mostly found in this study. This is the same result with the study of Abdullah et al who reported findings of ossicular destruction in 91% of cases of COM underwent CWD. The most commonly found was destruction in the incus (87%). Varshney et al reported intraoperative findings of COM in 85% with ossicular destruction and 25% Austin kartush type D [5,17,18].

![Surgical Procedure in COM Patients](image_url)

**Figure 3.** Surgery procedure in COM patients at Mohammad Hoesin Hospital Palembang.
Figure 4. Intraoperative finding of ossicular chain status based on Austin-Kartush classification in COM patients underwent surgery at Mohammad Hoesin Hospital Palembang. Notes: M (Maleus), I (Incus), S (Stapes), (+) intact, (-) absent.

5. Conclusions
The prevalence of COM with cholesteatoma ini our center is still high, especially in adolescent and adults. Operative management using CWD technique is preferred in cases of COM with cholesteatoma. Increasing public awareness about the dangers of COM by actively educating and counseling can prevent further complications.

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