



## Research Article

# Contralateral Ear Findings in Chronic Otitis Media

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### Abstract

**Objectives:** Chronic otitis media (COM) reveals a spectrum of otoscopic findings, and both ears may be affected to a different degree. The analysis of contralateral ear in patients with COM is important to detect the early signs of the disease. This may enable the follow-up and treatment of abnormalities in contralateral ear without delay. Therefore, in this study, we aimed to investigate the otoscopic and audiologic findings of contralateral ears of patients with COM.

**Methods:** The institutional data of patients who underwent surgical treatment between 2014 and 2017 due to COM were reviewed. Suppurative ears with cholesteatoma, polyps, and otorrhea refractory to medical treatment and ears with dry middle ear mucosa, with otorrhea responsive to medical treatment, and without cholesteatoma were divided into two groups (Group 1 and Group 2, respectively). All patients were examined with regard to the presence of perforation, retraction, myringosclerosis, atrophy, and audiological results before the groups were compared.

**Results:** Approximately 50% of contralateral ears of patients with COM showed abnormalities at an otoscopic examination in both groups. Tympanic membrane retraction in Group 1 was greater than in Group 2, and the difference was statistically significant ( $p < 0.05$ ). Both the mean air and bone conduction thresholds of the contralateral ears in Group 1 were also found to be elevated when compared with Group 2, and the differences were statistically significant ( $p < 0.05$ ).

**Conclusion:** COM may be seen bilaterally due to the same predisposing factors affecting the ears. Therefore, detection, follow-up, and early treatment of abnormalities of contralateral ear associated with otitis media have clinical importance in the prevention or delaying progression of these abnormalities to COM.

**Keywords:** Chronic otitis media; contralateral ear; retraction.

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Chronic otitis media (COM) is a major health problem, especially in developing and underdeveloped countries. The chronic nature of the disease can lead to repeated hospital visits and increased financial burden, hearing loss, and related social problems concerning ear discharge, education/learning difficulties, and especially in untreated cases, life-threatening complications.

COM is a disease that can affect both ears. Therefore, it is important to know the findings of the contralateral ears other than the affected ears to determine the changes in

the tympanic membrane before the onset and during COM in this ear. For this purpose, the data of the patients who were operated on for COM between 2014 and 2017 were reviewed retrospectively. Otoscopic findings, audiologic examinations, and tomography images of the ipsilateral and contralateral ears of the patients were evaluated.

### Methods

In this study, a total of 295 (131 females/164 males) patients who had been operated for the management of COM at the

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Otorhinolaryngology and Head and Neck Surgery Clinic of the Etfal Training and Research Hospital between 2014 and 2017 were included in the study. The study was approved by the Ethics Committee of our hospital (approval number, 1764). The patients' data were obtained from the clinic archives. Age, gender, ear examination findings, audiologic test results, tomography reports and radiological images of the patients, the type of operation performed, and surgical findings were transferred to the computer environment.

The patients were divided into two groups, considering the condition of the ear and the operation performed. Group 1 included bad ears, and Group 2 dry ears. Bad ears were characterized by cholesteatomas, suppurative, and/or malodorous COM unresponsive or partially responsive to treatment, polyp in the middle ear or extending to external ear, edematous and hypertrophic middle ear mucosa, retraction pockets of tympanic membrane from inside cholesteatoma or aspirated squamous epithelial cells, radiologically defined loss of significant aeration in the middle ear and mastoid, destruction of bone structures, and complicated COM. Mastoidectomy was added to the surgical treatment of all the patients in this group.

Dry ears are characterized by priorly with hearing loss, centrally perforated ears without discharge, otorrhea responsive to treatment, naturally appearing middle ear mucosa without retraction pockets, and those treated only with tympanoplasty and without additional mastoidectomy or atticotomy. The treated ear was defined as the ipsilateral and opposite ear as the contralateral ear.

In the contralateral tympanic membranes of the patients in both groups (bad and dry ears), (1) perforation, (2) retraction, (3) myringosclerosis, (4) atrophy/pseudomembrane, or (5) natural examination findings were noted. After dividing retractions as pars tensa and pars flaxida perforations, they were categorized as mild/moderate and severe retractions according to the Sade and Berco<sup>[1]</sup> classification (Table 1). According to pure-tone audiometry results, all patients' 500, 1000, 2000, and 4000 Hertz average pure-tone air and bone conduction threshold values were recorded.

Patients who had undergone exploratory tympanotomy, stapedectomy/stapedotomy, revision ear surgery, ear tumor surgery, were under 18 years of age, had implanted paracentesis or ventilation tube, patients receiving only medical treatment, cases whose examination findings, surgical notes, audiologic examination or imaging (for patients with mastoidectomy) data could not be obtained were excluded from the study.

Adult patients with complicated or uncomplicated COM treated with tympanoplasty and tympanomastoidectomy were included in the study.

Both groups were compared in terms of contralateral ear findings. The SPSS version 15.0 (for Windows) was used for statistical analysis.

Descriptive statistics: categorical variables were expressed as numbers and percentages, and numerical variables as the mean, standard deviation, minimum, maximum, and median values. Since the numerical variables did not meet the conditions of normal distribution, two independent group comparisons were made using the Mann-Whitney U test. The ratios of the categorical variables among the groups were tested using the chi-squared analysis. The Monte Carlo simulation test was applied when the conditions were not met. The statistically significant level of alpha was accepted as  $p < 0.05$ .

### Results

Group 1 (bad ears) consisted of 68 (60.7%) male and 44 (39.3%) female patients, and the age range was 18–76 ( $42.9 \pm 14.4$ ) years. In Group 2 (dry ears), there were 96 (52.5%) male and 87 (47.5%) female patients, and the age range was 18–68 ( $35.4 \pm 12.0$ ) years. Accordingly, the mean age of the patients in Group 1 was higher than Group 2, and this difference was statistically significant ( $p < 0.001$ ). There was no significant difference between the two groups in terms of gender ( $p > 0.05$ ) (Table 2).

When two groups were compared in terms of otoscopic findings, 42.0% of the contralateral ears in Group 1 were

**Table 1.** Classification of tympanic membrane pars tensa, and pars flaxida retractions according to Sade and Berco<sup>[1]</sup>

Classification of tympanic membrane retractions		
Localization	Stage	Description
Pars tensa	Mild	Medial dislocation of the TM without extending to the ossicular chain or promontory
	Moderate	TM retraction extending, and contacting the incus
	Severe	Medialization of TM, which induces bony erosion and/or extending and contacting promontory
Pars flaxida	Mild	Minimum medial displacement of the TM
	Moderate	Medial dislocation of the TM extending and contacting the neck of malleus
	Severe	Medial dislocation of TM with adhesion and some bony erosion of incus

TM: Tympanic membrane.

**Table 2.** Distribution of patients in the bad and dry ear groups according to age and gender

	Bad ear		Dry ear		p
	Mean±SD (Min-Max)	(Min-Max)	Mean±SD (Min-Max)	(Min-Max)	
Age	42.9±14.4	(18-76)	35.4±12.0	(18-68)	<0.001
	n	%	n	%	
Gender					
Male	68	60.7	96	52.5	0.166
Female	44	39.3	87	47.5	

SD: Standard deviation; Min: Minimum; Max: Maximum.

natural, and 56.8% of the contralateral ears in Group 2 were natural, and this difference was statistically significant (p=0.013) (Table 3). According to this, abnormal otoscopic findings were detected in 58% and 43.2% of the contralateral ears in Groups 1 and 2, respectively.

Mild/moderate retraction rates in the contralateral ears in Groups 1 and 2 were 20.5, and 6.6%, respectively, with a statistically significant intergroup difference (p=0.001) (Table 3).

The rates of hearing loss in the contralateral ear were 63.4% in Group 1 and 46.4% in Group 2 (p=0.005) (Table 3). When

the groups were compared in terms of pure-sound hearing averages, both air and bone conduction averages were higher in Group 1 than in Group 2, and differences between groups were statistically significant (p<0.001, p<0.001, respectively) (Table 3).

There was no statistically significant difference between groups in terms of perforation, severe retraction of pars tensa, mild/moderate and severe retraction of pars flaxida, myringosclerosis, and atrophy (p>0.05) (Table 3). There was no statistically significant difference between groups in terms of the level and type of hearing loss (p>0.05) (Table 3).

### Discussion

Otitis media is a common disease worldwide. According to the literature, the prevalence of COM varies between 0.5% and 30%, affecting over 20 million people worldwide.<sup>[2, 3]</sup> The annual cost of the disease has been reported as \$5 million in the United States.<sup>[4]</sup>

COM is characterized by the perforation of the eardrum, recurrent otorrhea and hearing loss, and histopathological inflammation in the middle ear mucosa and sometimes irreversible tissue damage. The disease develops within a

**Table 3.** Comparison of the patients in bad, and dry ear groups according to contralateral otoscopic ear findings, and hearing thresholds

	Bad ear		Dry ear		p
	n	%	n	%	
Natural	47	42.0	104	56.8	0.013
Perforation	26	23.2	47	25.7	0.633
PT retraction mild/moderate	23	20.5	12	6.6	<0.001
PT retraction severe	1	0.9	4	2.2	0.653
PF retraction mild/moderate	5	4.5	3	1.6	0.161
PF retraction severe	4	3.6	1	0.5	0.071
Myringosclerosis	10	8.9	12	6.6	0.452
Atrophy/pseudomembrane	2	1.8	5	2.7	0.713
Hearing loss	71	63.4	85	46.4	0.005
Level of the hearing loss					
Very mild	22	19.6	28	15.3	0.620
Mild	18	16.1	28	15.3	
Moderate	22	19.6	19	10.4	
Moderate advanced	6	5.4	5	2.7	
Advanced	3	2.7	3	1.6	
Very advanced	0	0.0	2	1.1	
Type of hearing loss					
SNHL	27	24.1	23	12.6	0.088
Mixed	22	19.6	21	11.5	
Conduction	22	19.6	41	22.4	
	Mean±SD (Median)		Mean±SD (Median)		P
Air conduction	29.4±18.1 (23)		23.5±18.0 (17)		<0.001
Bone conduction	17.8±13.5 (15)		12.4±11.8 (8)		<0.001

PT: Pars tensa; PF: Pars flaxida; SNHL: Sensorineural hearing loss; SD: Standard deviation.

spectrum of various symptoms and signs. While a simple retraction gives minimal symptoms, it can progress as destructive dilatation to cholesteatoma.

This continuity model, suggested in the development of COM, discloses the progressive nature of the disease.<sup>[4-6]</sup> According to this theory, COM may come in the form of different pathological phases. The stages observed in the development of the disease can also manifest itself in the contralateral ear. In a series of 500 patients with COM, abnormal otoscopic examination findings were detected in 75% of the contralateral ears of the patients.<sup>[7]</sup>

In another study, audiometric hearing loss was detected in the contralateral ears of 30% patients with COM.<sup>[8]</sup> Chalton and Stearns<sup>[9]</sup> reported pathologic otoscopic findings in 53% of the contralateral ears of 73 patients who underwent canal wall-down tympanomastoidectomy due to cholesteatoma, and most of these cases were pars tensa retractions.

Based on these studies, detection, evaluation, and early treatment of contralateral ear pathologies that can be seen simultaneously in patients with COM may prevent disease progression and reduce treatment costs and complication rates associated with the disease. For this purpose, contralateral ear findings of the patients who were operated on for COM in our clinic were retrospectively screened.

We aimed to determine the findings of the contralateral ears by forming two groups according to the severity level of the operated ear. Group 1 included ears with destructive radiological findings with limited response or no response to the treatment, ears with cholesteatoma, polyps, or hypertrophic middle ear mucosa, and therefore additionally underwent surgical treatment with mastoidectomy. Group 2 included dry ears, otorrhea that responded to treatment, patients predominantly with hearing loss, and patients treated with tympanoplasty.

Examination and audiological findings of the contralateral ears of the two groups were compared. Accordingly, pathological otoscopic findings were detected in 58% and 43.2% of the contralateral ears of the bad and dry ear patients, respectively.

Consistent with the literature, pathological findings at varying levels in the contralateral ears of patients with COM support the tendency of the ears to be affected bilaterally, and these features are observed to be more severe on the diseased side.

When the contralateral ears were viewed from the tympanic membrane retraction angle, a mild/moderate pars tensa retraction was observed in 6.6% of dry ears and three times higher (20.5%) in the bad ears. However, severe pars

tensa retraction did not show a statistically significant difference between the two groups. There was no significant difference in the comparison of groups in terms of pars flaxida retractions. However, in the literature, contralateral tympanic membrane retractions were not divided as pars tensa and pars flaxida retractions in some studies, and they were all evaluated all together.<sup>[7, 10]</sup> In our study, tympanic membrane retraction was observed in 33 (33/112) (29.46%) patients in the bad ear and 20 (20/183) (10.9%) patients in dry ear groups. An approximately 3 times higher number of retractions that was observed in the contralateral ear in the bad ear group and the presence of older patients in this group also suggest that the duration of the disease should be considered in retraction formation and in the progress to chronicity.

Since tympanic membrane retraction is an important step in initiating the process toward formation of chronic otitis, it is the only otoscopic finding that made a difference in our study. As a matter of fact, perforation, myringosclerosis, and atrophy of the ear membrane did not show any significant differences between the groups.

When the hearing level in the contralateral ear was examined, hearing loss was found in 71 (71/112) (63.4%) patients in the bad and 85 (18/46) (46.4%) patients in the dry ear groups. When the bone and air-conduction thresholds were compared between the groups, mean air conduction threshold values were  $29.4 \pm 18.1$  in Group 1, and  $23.5 \pm 18.0$  in Group 2, and the mean air-conduction threshold value was found to be statistically higher in Group 1. Similarly, the mean bone conduction threshold values were  $17.8 \pm 13.5$  and  $12.4 \pm 11.8$  in Groups 1 and 2, respectively, and the Group 1 thresholds were significantly higher than those in Group 2.

Increased bone conduction threshold values in Group 1 may be explained by the higher average age of this group. However, the fact that the higher mean air conduction threshold values are in Group 1 may be a result of statistically significant increase in pathologic otoscopic findings in this group compared to Group 2.

Detailed and thorough examination of both ears in COM patients plays a key role in the prognostic evaluation of each patient, because the ear with COM can give an idea concerning pathological progression in the contralateral ear. Therefore, it is important that the contralateral ear is very well monitored, particularly in bad ears. Indeed, the ears should be analyzed as a pair, not as a separate unit. COM occurring in one ear can be useful in predicting the possible clinical course of the other ear.

In conclusion, according to this study, approximately half of COM patients have pathological findings in the contra-

lateral ear. Since etiologic factors may affect both ears, and COM has a tendency to progress, it is important that the contralateral ear should be evaluated as carefully and detailed as the ipsilateral ear. Among pathological findings, especially tympanic membrane retractions in the contralateral ear are remarkable.

This finding indicates the importance of retraction in the developmental process progressing to COM. However, ipsilateral ear findings may give an idea about possible clinical course of the contralateral ear. This is the reason why both ears should be evaluated as a whole. Detection, follow-up, and early treatment of pathologic findings of the contralateral ear have clinical importance in terms of preventing or delaying the development of potential COM.

### Disclosures

**Ethics Committee Approval:** The study was approved by the Ethics Committee of our hospital (approval number, 1764).

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**Conflict of Interest:** None declared.

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