

## Original Research Article

# A STUDY OF CLINICO-HISTOPATHOLOGICAL CHANGES IN OSSICLES IN COM WITH CHOLESTEATOMA

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Received : 05/10/2024  
Received in revised form : 22/11/2024  
Accepted : 07/12/2024

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DOI: 10.70034/ijmedph.2024.4.208

Source of Support: Nil,

Conflict of Interest: None declared

**Int J Med Pub Health**

2024; 14 (4); 1143-1148

### ABSTRACT

**Background:** Chronic suppurative otitis media is a stage of ear disease in which there is an on-going chronic infection of the middle ear without an intact tympanic membrane. Cholesteatoma is a growth behind tympanic membrane. It develops when dead skin cells gather behind your eardrum to form a lump or cyst that may look like a pearl. Without treatment, it may become infected or grow large enough to damage hearing and facial nerve. Surgery to remove the growth is the only way to treat a cholesteatoma. **Objective:** To evaluate the histopathological state of the remnants of ossicles in chronic suppurative otitis media with cholesteatoma.

**Materials and Methods:** After getting consent from the patients, 50 samples were randomly selected. Patients suffering from unilateral or bilateral CSOM with cholesteatomatous pathology of both the sexes and of different age groups were screened that fulfill the criteria laid down for the study. All patients were subjected to mastoid surgery either modified radical mastoidectomy. A curved post-aural incision a centimeter posterior was made. Mastoid antrum was exposed and various landmarks were inspected. The pathology was exteriorized and mastoid bowel so formed was smoothed. The destroyed ossicles removed at the time of surgery were subjected for histopathological examination.

**Results:** Results show bone absorption and chronic inflammatory reaction were the most frequent pathological changes observed.

**Conclusion:** It was concluded that the ossicles (unilateral or bilateral) were involved in all the cases of chronic suppurative otitis media with cholesteatoma and the long process of incus is the most common eroded part of the ossicle in unsafe chronic suppurative otitis media.

**Keywords:** Ear disease, bone changes, cholesteatoma, Chronic suppurative otitis media, tympanic membrane.

## INTRODUCTION

Chronic suppurative otitis media is a long standing infection of a part or whole of the middle ear cleft. Chronic suppurative otitis media is a persistent disease, insidious in onset often capable of causing severe destruction and irreversible sequelae and clinically manifests with deafness and discharge (Scott Brown 1987). The most common microorganisms found in this pathology

Staphylococcus aureus (MRSA). Others like are Pseudomonas aeruginosa, Proteus spp, Klebsiella spp, Bacteroides spp. and Fusobacterium spp can cause the disease. Less common are Aspergillus spp and Candida spp. which are more frequently found in patients immunocompromised. In chronic suppurative otitis media, bacterial pathogens invade the mucosa of the middle ear through the external canal. Cholesteatoma is a proliferation of keratinized, stratified squamous epithelium in an anomalous location, generally in the middle ear with

an osteolytic potential (Jackler, Dillon and Schindler,1984) Cholesteatoma which was first described as ‘Pearly Tumour’ due to its bone eroding property is thought to be most important and common cause for these changes. It is indicated that the presence of attic cholesteatoma seemed to be associated with more constant and severe bone changes in the ossicles.

Histo-pathology states that the changes observed in bone spaces were congestion and infiltration by lymphocytes and plasmacytes. Bone spaces were also destroyed and obliterated by granulation tissue. The most common change observed in 82.6% cases is bone absorption was due to osteoclasia, vascular erosion, halisteresis followed by infiltration by inflammatory cells in bone spaces. Primary aim of the present study is to evaluate the histopathological state of the remnants of ossicles in chronic suppurative otitis media with cholesteatoma.

## MATERIALS AND METHODS

This study was based on 50 cases were selected from ENT outpatient department, Ram Lal Eye and ENT Hospital, Amritsar with chief complaints of Ear discharge and Hearing Loss. Patients suffering from unilateral or bilateral CSOM with cholesteatomatous pathology of both the sexes and of different age groups were screened from the E.N.T. outpatient department of Ram Lal Eye and E.N.T. Hospital, Amritsar fulfilling the criteria laid down for the study.

An informed consent of patients was taken and approval from institutional ethical committee was obtained. All cases were subjected to mastoid surgery either modified radical mastoidectomy. Patient was operated under general anaesthesia using either, nitrous oxide and oxygen mixture.

**Table 1: Occurrence of symptoms during the course of illness**

Symptom	Total no. of cases	Percentage
Ear Discharge		
Foul smelling	40	80
Purulent	10	20
Earache		
Intermittent	20	40
Continuous	-	-
No Pain	30	60
Fever		
Intermittent	10	20
Continuous	-	-
Deafness		
Progressive	All cases	100
Non-progressive	-	-
Tinnitus		
Intermittent	-	-
Continuous	5	10
Vertigo; Nausea and vomiting; headache	-	-
Facial palsy	2	4

Table 1: Shows occurrence of various symptoms among patients during the course of illness. The patients of the present study had in common, the complaints of foul smelling continuous otorrhea and progressive deafness right from the onset of the ear trouble. The other symptoms like earache, fever tinnitus etc. were also present inconstantly and that probably due to fresh attack of otitis media. Only 5 patients had constant tinitis and in addition had facial paresis on right side. Both the patients had facial paresis on right side. Both the patients had extensive cholesteatoma. None of the patients complained of vestibular and intracranial symptoms like vertigo, nausea and vomiting and headache etc.

### Surgical procedure

It was cleaned with betadine (Povidine-iodine 5%) solution, normal saline containing few drops of adrenaline (1:100000) injected at the postaural site, a curved postaural incision a centimeter posterior and parallel to retroauricular groove deep up to periosteum made, mastoid antrum exposed and inspected for the following.

- Presence of cholesteatoma / granulations / polyp/cholesterol granuloma and their extension into the mastoid
- State of ossicles
- Continuity and mobility of ossicles, if intact.
- Facial nerve canal dehiscence or not, any pathology converting it or any abnormal course
- Erosion of tegmen tympani and antri, sinus plate, sinodural angle
- Exposure of middle or crania fossa dura

The pathology was exteriorized and mastoid bowl so formed was smoothed. Facial bridge removed, facial ridge lowered, stapedal or peristapedal area was least touched. Antiseptics dressing was done. The destroyed ossicles (malleus and/or incus) removed at the time of surgery was closely inspected for their macroscopic findings regarding site and extent of destruction. There after ossicles were subjected for histopathological examination. Patient was out on antibiotics along with analgesics and anti-inflammatory were removed on 7th day. Follow-up was done at weekly, monthly and three-monthly intervals.

## RESULTS

### Histopathological Examination

The ossicles removed during surgery was preserved in thylene diamine tetra-acetic acid (EDTA) 4% formaline 10% solution and sent for histopathological examination.

#### Following landmarks were seen

1. Depth of erosion of the ossicles
2. Infiltration by keratinized squamous epithelium into the haversian system of ossicles
3. Presence of different type of chronic inflammatory cells (Figure-3)
4. Any osteoblastic and/or osteoclastic activity.

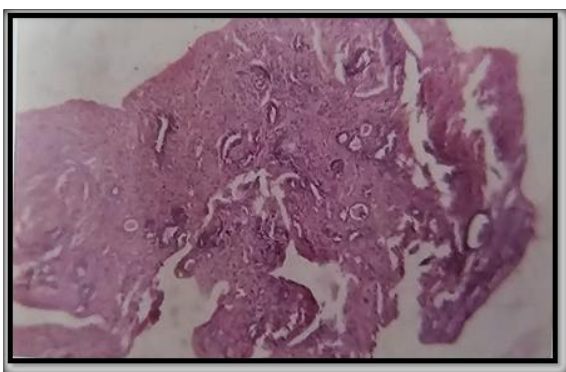


Figure 1: Photograph showing fibrous tissue entrapping glands (aural polyp) under low power

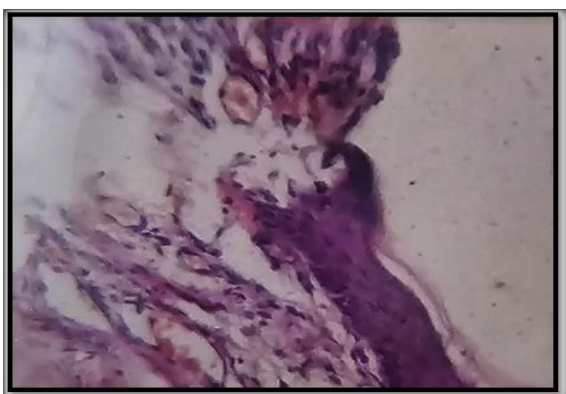


Figure 2: Photograph showing keratinized squamous epithelium under high power

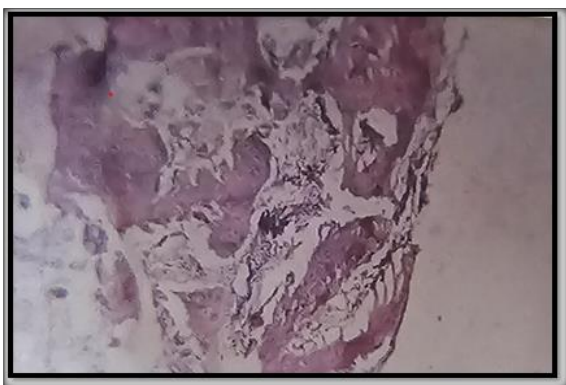


Figure 3: Photograph showing chronic inflammatory cells in-between bony trabeculae under low power

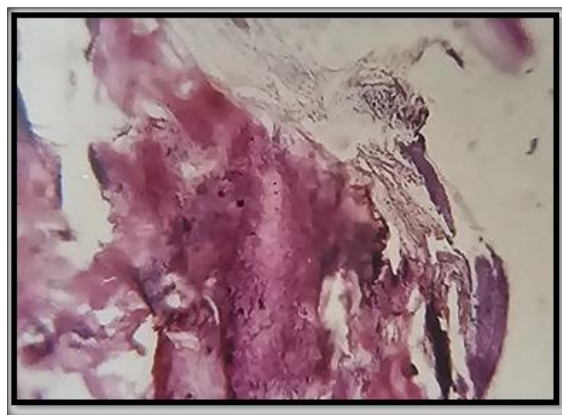


Figure 4: Photograph showing necrotic bony trabeculae with squamous epithelium under low power

Table-2 depicts the incidence of type of ear drum perforation along with their percentage. Examination of ear revealed that 50% of cases had attic perforation. 40% having postero-superior marginal perforation which foul smelling discharge in all cases. Most of the cases of perforation revealed flakes of cholesteatoma on otoscopic examination. During surgery, it was found that 4 cases with polyp had attic perforation while 1 had postero-superior perforation. Incus was involved in 100% of cases. Malleus was involved along with incus in 40% of cases. In cases incus was completely missing. [Table 2]

Table-3 shows Long process of incus was involved in all the cases (100%) in the cholesteatomatous pathology. Long process and short process were involved in combination in 50% cases. Handle of malleus was eroded in 32% of cases. Malleus was intact in 60% cases and pitted and head eroded in 8% of cases. [Table 3]

Table-4 As depicted in the table, all the cases showed congestion and chronic inflammatory cells. In 70% cases fibrous tissue was seen. Actively secreting glands were present in 10% cases. [Table 4]

Table-5 depicts incidence and nature of bone changes in ossicles studied histopathologically. Common finding in ossicles was the chronic inflammatory reaction in all the cases with congestion. Bone destruction and absorption was seen in 85% cases. New bone formation in 25% cases. Mallei which were morphologically intact also showed signs suggestive of chronic inflammatory changes. [Table 5]

Table-6 shows Correlation of Clinical finding operative finding with histopathological findings of mucosa covering the ossicles. Cholesteatoma with granulations was present in 6 cases of attic perforation but was more common in 9 cases with postero-superior marginal perforation cases. Keratinized stratified squamous epithelium was more common in attic perforation. In rest of the cases of attic perforation cholesteatoma was

localized to attic and antrum only and were without granulations. [Table 6]

Table-7 shows chronic inflammatory cells were present in both type of cases. Increased vascularity and new bone formation was seen in both the types in almost equal proportions. However, bone destruction and absorption was much more common in attic perforation as compared to postero-superior marginal perforation case. [Table 7]

Table-8 shows duration of ear disease with percentage. In most of patients, the problem started right in early childhood and the total period extended over many years. It also shows in almost 25% cases, there was a gain of 21-30 db hearing while 45% cases had no improvement and in 30% cases, worsening of hearing was observed. [Table 8]

**Table 2: Incidence of type of ear drum perforation with percentage and involvement of ossicles with percentage**

Type of perforation	No. of Cases	Percentage
Attic	25	50
Postero-superior marginal perforation	20	40
Polyp filling meatus	5	10
Ossicles	No. of cases	Percentage
Incus	50	100
Malleus and incus	20	40

**Table 3: Showing gross ossicular finding with percentage**

Ossicles	Gross Finding	No. of Cases	Percentage
Incus	Long Process (eroded)	50	100
	body & long process (pitted)	15	30
	Long process & short process	25	50
	Body of Incus	5	10
	Incus completely missing	5	10
Maleus	Intact	30	60
	Handle eroded	16	32
	Pitted and head eroded	4	8
	Malleus completely missing	-	-

**Table 4: Incidence and nature of subepithelial changes in ossicles**

Subepithelial Changes	No. of Cases	Percentage
Congestion	50	100
Chronic Inflammatory cells	50	100
Cystic dilated glands	5	10
Fibroblasts proliferation	35	70

**Table 5: Incidence and nature of bone changes in ossicles studied histopathologically**

Bone Changes	No. of Cases	Percentage
Normal Bone	-	-
Changes in bone spaces Congestion of blood vessels	30	60
Infiltration by inflammatory cells	50	100
Granulation tissue	20	40
Fibrous tissue	10	20
New bone formation	10	20
Bone destruction and absorption	40	80

**Table 6: Showing Correlation of Clinical finding operative finding with histopathological findings of mucosa covering the ossicles**

Type of Perforation	No. of cases	Operative findings			Histopathological findings			
		Granulation	Polyp	Cholesteatoma	Stratified epithelium	Keratinized stratified squamous	Columnnar/cuboidal	No epithelium
Attic	29	6	4	29	10	12	4	3
Posterior superior	21	9	1	21	2	6	2	11

**Table 7: Correlation of clinical findings, operative findings and histopathological findings of bone changes in ossicles**

Type of Perforation	No. of cases	Operative findings			Histopathological findings			
		Granulation	Polyp	Cholesteatoma	Chronic inflammatory cells	Increased vascularity	New bone formation	Bone absorption & destruction
Attic	29	6	4	29	29	10	4	27
Postero superior	21	9	1	21	21	9	5	13

**Table 8: Showing duration of ear disease with percentage and Change in hearing in dB after 3 months of operation**

No. of Years	Total no. of cases	Percentage
0-5	15	30
6-10	20	40
11-15	15	30
More than 15	-	-
Gain in hearing in dB	No. of cases	Percentage
0-10	-	-
11-20	-	-
21-30	5	25
No improvement	9	45
Hearing worsened	6	30

## DISCUSSION

The operations performed for cases of squamosal type of otitis media were radical and modified radical mastoidectomy.

In 2 cases sr. no.6, sr. no.12, extensive cholesteatoma was present which had destroyed the ossicles, both sigmoid sinus and dura was lying exposed in sr.no.12 patient. Facial nerve was also lying exposed. After ensuring the thorough removal of the disease from the mastoid segment and middle ear cavity, reconstruction of the middle ear hearing mechanism was in others only eradication of infection was done. Ossicles where diseased were removed and sent for histopathological examination. In all the cases either one or both the ossicles (malleus and incus) were involved. So, either of the ossicles were involved in 100% cases of chronic suppurative otitis media with cholesteatoma. But involvement of incus was much more common than malleus. Incus was involved in 100% of the cases either singly or in combination with malleus. Malleus was involved in 40% cases. Fortunately, stapes and its suprastructure were not involved in any of the case. Present study results were in close agreement with Grippaudo (1958); Meyerhoff (1978); Mathur Et Al (1991); Singh P Et Al (2018) and Nikakhlagh NS Et Al (2019).

It was found on gross examination of the ossicles that the long process of incus was involved in 100% cases. Hiranandani and Deshpande (1969) observed that short at par with them. But our findings

coincide with the findings of Sade et al (1981); Mathur et al (1991) and Iqbal et al (1994) who observed that long process of incus is involved first. The reason that the long process of incus was most frequently affected was likely to be its delicate structure and precarious blood supply to lenticular process of incus as described by Nager and Nager (1953).

In this study bone changes were observed in 100% ossicles studied histologically. Chronic inflammatory cells were seen in all the cases, bone absorption and necrosis in 80% cases and new bone formation 20% cases. The bone changes seen in chronic suppurative otitis media are more or less the manifestations of chronic osteomyelitis. This confirmed the findings of freidmann (1950) who had emphasized that the basic pathology of otitis media has not changed in the antibiotics era.

Epithelial and subepithelial changes were observed and found that keratinized stratified squamous epithelium was present in 36% cases. Stratified squamous in 245 cases. Cuboidal to low columnar in 12% cases. No the epithelium was seen in 28% cases. predominant cells found in the tissue were the fibroblasts (70%). Cystic gland were seen in 10% cases. In present study 100% had chronic inflammatory reaction in the subepithelial region. These findings were consistent with those of schunknecht and other workers (1974).

Present study findings are not at par with palva et al (1968) who observed massive increases in number and size of mucus glands and formation of cyst like

cavities. In present study subjects mucus secreting cells were seen only in 10% cases.

The high incidence of bone changes seen in the ossicles in unsafe chronic suppurative otitis media suggest that their retention during mastoid surgery may not be beneficial in producing long term hearing results prejudice the success of reconstructive procedure. The results of the study were similar with the results of the study conducted by mathur et al in1987.

## CONCLUSION

The clinical study comprised of fifty patients suffering from chronic suppurative otitis media irrespective of their age, gender and unilateral or bilateral pathology. The diseased ossicles were removed and sent for histopathological examination. The reporting of the histopathological examination was then compared with clinical as well as operative findings.

Present study concluded that the ossicles (unilateral or bilateral) were involved in all the cases of chronic suppurative otitis media with cholesteatoma and the long process of incus is the most common eroded part of the ossicle in unsafe chronic suppurative otitis media. Bone absorption and chronic inflammatory reaction were the most frequent pathological changes observed. These high incidence of bone changes seen in the ossicles in unsafe chronic suppurative otitis media suggests that their retention during mastoid surgery may not be beneficial in producing long term hearing results.

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