

Evaluation of Extracranial Complications of Chronic Suppurative Otitis Media (CSOM) and Their Management: A Retrospective StudyVyankatesh Ganesh Polawar¹, Ashok Bhimrao Garje², Ninad Gaikwad³¹Consultant, Department of ENT, Polawar Hospital, Dharashiv, Maharashtra, India.²Assistant Professor, Department of ENT, Terna Medical College and Hospitals, Nerul (west), Navi Mumbai, Maharashtra, India.³Professor & HOD, Department of ENT, HBT Medical College and Dr. R. N. Cooper Hospital, Juhu, Mumbai, Maharashtra, India.

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Conflict of interest: Nil

Abstract:**Background:** To study clinical profile and management of extracranial complications of chronic suppurative otitis media (CSOM)**Methods:** The present Retrospective study was conducted in the Department of ENT, of Tertiary Health care Hospital during the period of one and half years. All patients of CSOM (Age More than 18 years and both sexes) clinically diagnosed with extracranial complications and diagnosis confirmed by CT scan and willing to give consent were included.**Results:** The postaural abscess was the commonest complication followed by labyrinthine fistula and mastoiditis. The lateral semi-circular canal was the most commonly involved in labyrinthine fistula.

The most common age group with complications was 21-30 years. Males were more commonly affected than females (Male: Female =1.5:1). The commonest symptoms were otorrhea and decreased hearing, which were seen in all cases. The duration of ear discharge is not associated with the number of complications.

The otoscopic findings of the tympanic membrane were central perforation (36.67%), attic perforation (36.67%), posterosuperior retraction pocket (23.33%), cholesteatoma (26.67%) and granulations (13.33%). The bacterial flora study showed pseudomonas aeruginosa as the commonest organism cultured from ear discharge followed by staphylococcus aureus. The pathology found most common was cholesteatoma followed by both cholesteatoma and granulations. Intraoperative, the ossicle that was found necrosed in most of our cases was the incus.

Conclusion: The extra-cranial complications of chronic suppurative otitis media pose a great challenge to the otolaryngologist despite its declining incidence. The postaural abscess was the commonest complication with most common age group 21-30 years with male preponderance. The canal wall down mastoidectomy is preferred treatment. Early diagnosis and prompt surgical intervention are most important for the decreased morbidity and mortality of these patients.**Keywords:** Chronic Suppurative Otitis Media (CSOM), Mastoiditis, Subperiosteal Mastoid Abscess, Labyrinthine Fistula, Dehiscent Facial Nerve, Cholesteatoma, Granulation tissue, Tympanoplasty, Mastoidectomy.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Chronic suppurative otitis media is a major problem in otorhinolaryngology. The discharging ear is usually ignored by majority of patients till complications arise, which can be hazardous to life. Suppurative Otitis media can have fearsome complications. Man knew their existence ever since the time of Hippocrates. The early physicians knew that the inflammation and pain of the ear can lead to insanity and death. We were not able to eliminate these complications in spite of the availability of new generation antibiotics and better diagnostic facilities.

As per Politzer, the temporal bone has four sides, outside is bound by life from which there comes the auditory canal, one form of our appreciation of what our life means, on other three sides this bone is bounded by death. Chronic Suppurative Otitis media has been traditionally described as a chronic inflammation of the middle ear cleft associated with perforation of the tympanic membrane and otorrhea. The proximity of the middle ear cleft and the mastoid air cells to temporal and the intracranial compartments places structures located in these areas at increased risk of infectious complications. [1]

Important factors causing complications are:

- High virulence of organisms
- Poor resistance of patient
- Inadequate antibiotic treatment of acute middle ear and mastoid infections.
- Presence of chronic systemic diseases, e.g. diabetes mellitus, tuberculosis, nephritis, leukemia, etc.
- Resistance of organisms to antibiotics, which is becoming common these days.

The extracranial complications of chronic suppurative otitis media are:

1. Mastoiditis
2. Mastoid Abscess
3. Luc's Abscess
4. Bezold's Abscess
5. Citelli's Abscess
6. Zygomatic Abscess
7. Labyrinthitis
8. Petrositis
9. Facial Nerve Paralysis

Mastoiditis

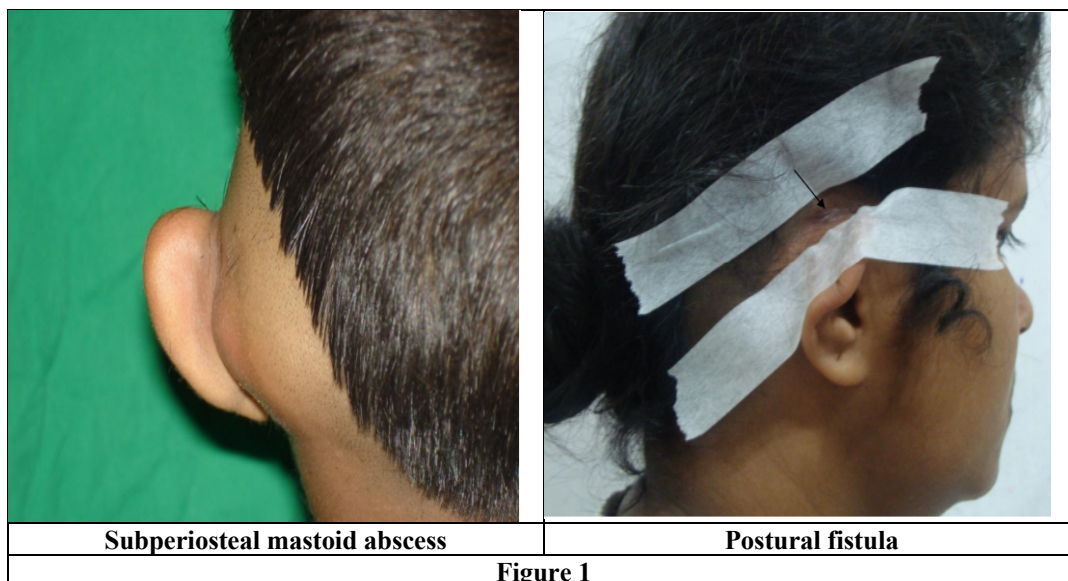
It is the infection of the mucoperiosteal lining of the mastoid air cells system. It is extension of the middle ear inflammation into antrum and mastoid air cells. It can be classified as

- Acute/catarrhal
- Chronic
- Coalescent
- Masked

Mastoid Abscess

This is of two types: Subperiosteal and Subcutaneous variety

- Subperiosteal abscess:** It is the collection of pus deep to the periosteum covering the lateral wall of the mastoid antrum, after erosion of mastoid cortex.
- Subcutaneous abscess:** It is the collection of pus in the subcutaneous post-auricular region after destruction of the periosteum and bone covering the lateral cortical wall of the mastoid.



Luc's Abscess: It is formed when pus from the mastoid antrum erodes the anterior wall of the mastoid bone, leading to a sagging of the posterior wall of the external auditory canal.

Bezold's Abscess: It is formed when pus from the mastoid bone erodes the mastoid tip and spreads along the sternocleidomastoid muscle, to localize in the neck.

Citelli's Abscess: It is formed when pus from the mastoid antrum spreads along the posterior belly of the digastric muscle, to localize in the posterior triangle of the neck.

Zygomatic Abscess: It is formed when the pus from the mastoid antrum erodes the mastoid bone anteriorly, producing an abscess in the zygomatic region.

Labrynthitis: This occurs when the infection reaches the inner ear either through the round or oval windows, or through a fistula formation in the promontory or bony labyrinth.

Schuknecht described three types:

1. Serous labyrinthitis
2. Otogenic suppurative labyrinthitis
3. Meningitic suppurative labyrinthitis

In acute phase, there is no clinical method for differentiating serous from suppurative labyrinthitis. If vestibular and auditory functions are partially or completely retained, it can be assumed that infection was serous. In addition to antibiotic treatment, adjuvant corticosteroid therapy is considered in labyrinthitis.

Petrositis

It is rare complication. This occurs when the cells of the petrous apex are involved due to spread of infection from the middle ear. The cells may coalesce to form an abscess. Localized meningitis may occur or an extradural abscess may occur. The sixth cranial nerve which supplies the ipsilateral lateral rectus muscle of the eye is involved in infection, as it passes near the petrous apex which results in the Gradenigo's syndrome which is a triad of symptoms comprising of:

- Persistent otorrhea
- Ipsilateral retro-orbital pain
- Abducent nerve palsy
- Facial nerve paralysis

This can occur due to direct involvement of the facial nerve in the middle ear or mastoid region and results in ipsilateral infranuclear palsy. The routes of spread of infection to facial nerve are:

1. Via natural dehiscence in fallopian canal, most often in its tympanic segment
2. Via natural pathways that connect middle ear and the lumen of the Fallopian canal such as canal for stapedius muscle, neurovascular connections, and mastoid air cells in close contact with fallopian canal
3. Via direct infection of bone around the fallopian canal (localized osteitis)

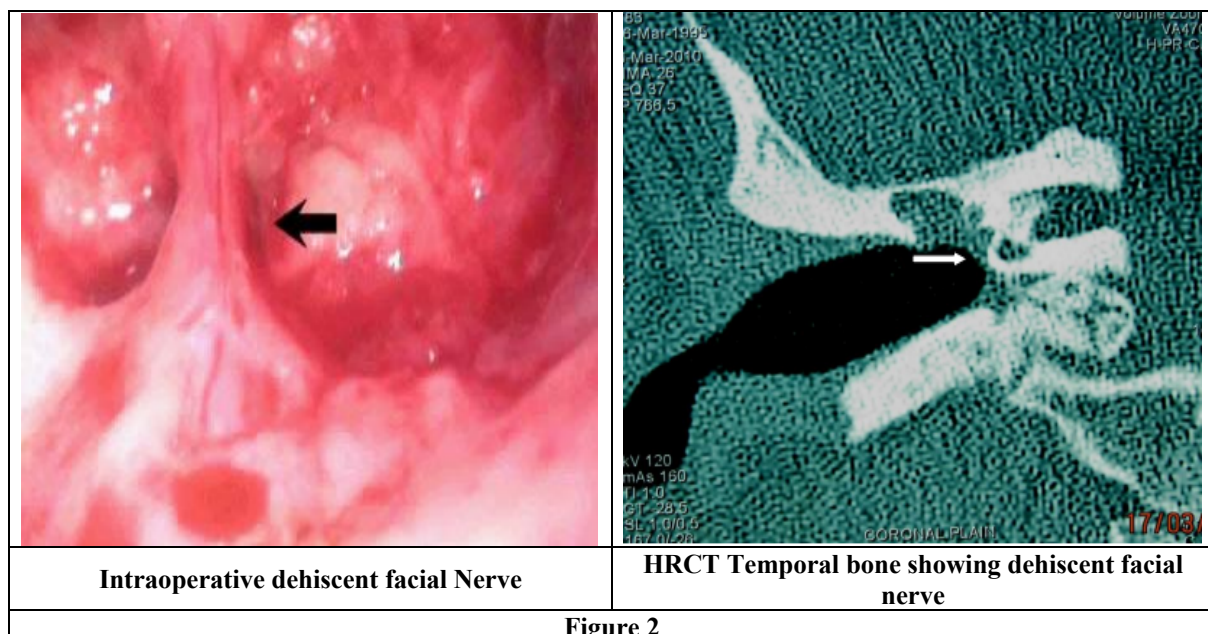


Figure 2

Extracranial complications are relatively rarely reported now-a-days in western literature, as their occurrence has reduced drastically due to early diagnosis and improved treatment available for the management of chronic suppurative otitis media. But in India the condition is quite reverse. Associated problems especially in our country include paucity of funds due to which newer sophisticated and precise diagnostic tools are not freely available. The primary health workers are still not fully well versed with the importance of early detection and treatment of ear diseases. Furthermore, with the continued development of multi-drug resistant pathogens, these complications may again become more prevalent as our current antibiotics become less effective. [2]

In present study, we have evaluated the various clinical presentations of these complications, the importance of early clinical detection and diagnosis through various imaging techniques and the appropriate treatment modalities in the form of medical therapy and surgery, thus preventing it from manifesting into life-threatening condition.

Aims and Objectives

- To study the incidence of extracranial complications of chronic suppurative otitis media (CSOM)
- To study
 1. Presenting symptoms
 2. Clinical signs
 3. Audiograms

4. CT scan
5. Intraoperative findings
6. Postoperative findings

Of extracranial complications of chronic suppurative otitis media

Materials & Methods

Study Design: Retrospective Study.

Study Setting: This study was carried out in the Department of ENT, of Tertiary Health care Hospital during the period of one and half years.

Subjects: All patients of CSOM above 18 years of age both males and females, clinically diagnosed with extra cranial complications and diagnosis confirmed by CT scan and willing to give consent were included. Patients with multiple extra-cranial complication or associated intracranial complications were included.

Method of Study

Detailed history of the patient was taken carefully. The aural symptoms like ear discharge with attention on duration, side, nature of discharge and associated symptoms like otalgia were inquired. The symptoms like swelling or discharge behind the ear, swelling in the neck, diplopia, vertigo, and asymmetry of face or any facial muscle weakness were inquired. The onset, duration and progression of the symptoms were also inquired. Other symptoms like fever, headache, vomiting, altered sensorium, convulsion which are neuro-otological symptoms were also be inquired.

A past history of any previous ENT illness and systemic illness like tuberculosis, diabetes and hypertension was inquired. A special inquiry of any medical or surgical treatment for aural discharge was inquired.

Inclusion Criteria

1. All patients of CSOM clinically diagnosed with extracranial complications and diagnosis confirmed by CT scan and willing to give consent were included.
2. Patients of more than 18 years and both sexes were included.
3. Patients with multiple extra-cranial complication or associated intracranial complications were included.

Exclusion Criteria

Cases with exclusive intra-cranial complications of CSOM were excluded.

Method of Examination: General condition of patient assessed. Features of toxicity, dehydration,

emaciation and anaemia looked for. Vital signs were recorded. A detailed ENT examination was done with more careful observation of the otoscopic findings, preauricular and post-auricular regions, mastoid tenderness, fistula and tuning fork tests. Neurological examination for features of raised intracranial pressure and localizing signs was carried out. Papilledema was ruled out.

Routine hematological and urine analysis was done in all cases. Culture and sensitivity of the ear discharge was also done to know the spectrum of organism in complications of CSOM. Radiological examination was done included X-ray of mastoid and computed tomography whenever possible. Sclerotic and lytic area suggestive of cholesteatoma and destruction of sinus or tegmen was looked for in X-ray.

Evidence of intra-cranial complications was confirmed by CT-scan. The temporal bone window CT-scan was done to know the extent of the disease. Audiological evaluation was done if general condition of patient permitted. Otomicroscopy was done before surgery to confirm the otoscopic findings.

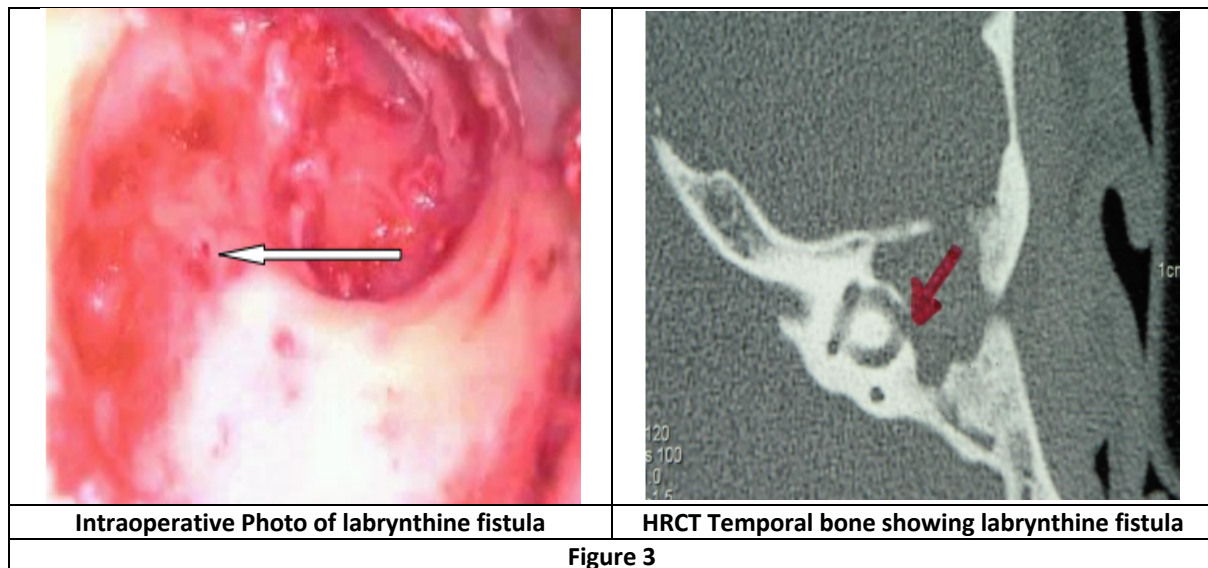
Treatment

The sub-periosteal abscesses were incised and drained immediately under local anaesthesia in majority of cases. Mastoid exploration was done in all cases that were fit and willing for surgery. Modified radical mastoidectomy was preferred in cholesteatoma ears.

Operative findings like presence of cholesteatoma, granulations, facial canal dehiscence, and erosion of semi-circular canals, sinus plate, tegmen plate and ossicular chain were noted.

In Petrositis [3] treatment given was aggressive in the form of intravenous antibiotics if it fails to respond within one or two days, mastoid exploration was done. Various approaches have been described for reaching the apex of the petrous part of the temporal bone. Freckner's approach, Dearmin and Fariior's approach, Eagleton's approach, Ramadier and Lempert approach, Kopetsky's and Almour's approach, Thornvaldt's approach.

Labyrinthine fistula was explored as the last step in surgery with temporalis fascia ready to be inserted over the defect. [4] If there is any tissue overlying the fistula it was left in place on the basis of an increased incidence of hearing loss in cases in which membrane was removed. [5]



Facial nerve paralysis [6] in CSOM patients was mostly due to cholesteatoma [7] the most common site of the facial nerve paralysis was the tympanic segment just proximal to the pyramidal genu. [8] This required the use of intravenous antibiotics and prompts surgical intervention. The surgery is indicated to arrest the disease process and to protect the nerve from partial destruction. If there is no cholesteatoma then intact canal wall mastoidectomy with exploration of the seventh nerve from geniculate ganglion to the stylomastoid foramen was done. In the presence of cholesteatoma, radical or modified radical mastoidectomy with decompression of the nerve

was done. If dehiscence of the nerve trunk is identified repair was performed using a nerve graft or nerve rerouting and end to end anastomosis. The granulation tissue over the nerve is left untouched to avoid further injury to the nerve.

Post-operatively antibiotics, analgesics and decongestants were continued. Suture removal was done on seventh post-operative day. During follow-up the mastoid cavities were cleaned and assessed for any persistent ear discharge. Patients were also assessed for any neurologic deficit.

Results

Table 1: Age Distribution of the Patients Studied

| Age in Years | No of Patients | % |
|--------------|----------------|-------|
| 21 – 30 | 9 | 30 |
| 31 – 40 | 5 | 16.67 |
| 41 – 50 | 6 | 20 |
| 51 – 60 | 3 | 10 |
| 61 – 70 | 3 | 10 |
| 71 – 80 | 4 | 13.33 |

In this study, 30 cases were studied. Out of which maximum number of cases are in third decade of life i.e. 9 cases (30%) and second largest number of cases are in fourth decade of life i.e. 5 cases (16.67%). The youngest patient was 21 years and oldest was 79 years old.

Table 2: Gender Distribution of Patients Studied

| Gender Distribution of Patients | No of Patients | Percentages |
|---------------------------------|----------------|-------------|
| Male | 18 | 60 |
| Female | 12 | 40 |
| Total | 30 | 100 |

In our study of 30 cases, 18 (60%) were males and 12(40%) are females. Males were affected more than females. The male to female ratio was 1.5: 1.

Table 3: Socioeconomic Status Distribution of Patients

| Socioeconomic Status | No of Patients | % |
|----------------------|----------------|-----|
| Low | 18 | 60 |
| Middle | 9 | 30 |
| Upper | 3 | 10 |
| Total | 30 | 100 |

In the study, maximum cases were belonging to low socioeconomic status (60%) followed by middle (30%) and then upper (10%) socioeconomic status.

Table 4: Duration of Ear Discharge

| Duration Of Ear Discharge | No Of Patients | % |
|---------------------------|----------------|-------|
| 1 - 5 years | 15 | 50 |
| 6 - 10 years | 10 | 33.33 |
| 11 - 20 years | 5 | 16.67 |
| Total | 30 | 100 |

In our study 50% patients have ear discharge less than 5 years and 50% have more than 5 years.

Table 5: Distribution of Symptoms

| Symptoms | No of Patients | % |
|--------------------|----------------|-------|
| Postaural Swelling | 14 | 46.67 |
| Neck Swelling | 1 | 3.33 |
| Facial Weakness | 5 | 16.67 |
| Giddiness | 7 | 23.33 |
| Fever | 20 | 66.67 |
| Diplopia | 1 | 3.33 |

The commonest symptoms were otorrhea and decreased hearing. 14 cases (46.67%) presented with postaural swelling. Neck swelling was present in single case (3.33%). Facial weakness was present in 5 cases (16.67%). Giddiness was present in 7 cases (23.33%). Fever was present in 20 cases (66.67%). Diplopia was present in single case (3.33%).

Table 6: Findings of External Auditory Canal

| External Auditory Canal | No of Patients | Percentages |
|-------------------------|----------------|-------------|
| Normal | 5 | 16.67 |
| Abnormal | 25 | 83.33 |
| Discharge | 17 | 56.67 |
| Aural Polyp | 8 | 26.67 |

In our study, 5 patients had normal and 25 patients had abnormal external auditory canal like 17 showing discharge and 8 had aural polyp.

Table 7: Findings of Tympanic Membrane

| Tympanic Membrane | No of Patients | Percentages |
|-----------------------------------|----------------|-------------|
| Central Perforation | 11 | 36.67 |
| Attic Perforation | 11 | 36.67 |
| Posterosuperior Retraction Pocket | 7 | 23.33 |
| Cholesteatoma | 8 | 26.67 |
| Granulations | 4 | 13.33 |

In our study, 11 (36.67%) patients had central perforation, 11 (36.67%) patients had attic perforation. 7 patients (23.33%) had posterosuperior retraction pocket. 8 patients (26.67%) had cholesteatoma and 4 patients (13.33%) had granulations in tympanic membrane.

Table 8: Pus for Culture

| Pus For Culture | No of Patients | Percentages |
|------------------------|----------------|-------------|
| Negative | 5 | 16.67 |
| Positive | 25 | 83.33 |
| Pseudomonas aeruginosa | 12 | 40 |
| Staphylococcus aureus | 4 | 13.33 |
| Proteus mirabilis | 3 | 10 |
| Streptococcus pyogenes | 2 | 6.67 |
| Escherichia coli | 1 | 3.33 |
| Klebsiella | 3 | 10 |

In our study, 5 patients had negative growth on culture. The commonest organism obtained from culture growth was Pseudomonas aeruginosa (40%) then was Staphylococcus aureus (13.33%).

Table 9: Pure Tone Audiogram

| Pure Tone Audiogram | No of Patients | Percentages |
|-------------------------|----------------|-------------|
| Conductive Hearing Loss | 20 | 66.67 |
| Mixed Hearing Loss | 10 | 33.33 |

In our study, 20 patients (66.67%) had conductive hearing loss and 10 patients (33.33%) had mixed hearing loss.

Table 10: Extracranial Complications

| Complications | No of Patients | Percentages |
|------------------------|----------------|-------------|
| Mastoiditis | 7 | 23.33 |
| Postaural Abscess | 14 | 46.67 |
| Postaural Fistula | 1 | 3.33 |
| Bezold's Abscess | 1 | 3.33 |
| Petrositis | 1 | 3.33 |
| Labyrinthine Fistula | 7 | 23.33 |
| Facial Nerve Paralysis | 5 | 16.67 |

In our study group, commonest complication was postaural abscess i.e. 14 patients (46.67%). Next common complication was labyrinthine fistula and mastoiditis i.e. 7 cases (23.33%) and then facial nerve paralysis i.e. 5 cases (16.67%).

Table 11: Extracranial Complications (Single or Multiple)

| Complication | No of Patients | Percentages |
|--------------|----------------|-------------|
| Single | 24 | 80 |
| Multiple | 6 | 20 |

In our study, 24 patients (80%) had single extracranial complications and 6 patients (20%) had multiple extracranial complications.

Table 12: Mastoid Air Cell System (Intraoperative Finding)

| Mastoid Air Cell System | No of Patients | Percentages |
|-------------------------|----------------|-------------|
| Pneumatic | 3 | 10 |
| Sclerosis | 27 | 90 |

In our study, mastoid air cell system was sclerotic in 27 patients (90%) and pneumatic in 3 patients (10%).

Table 13: Facial Canal Dehiscence

| Facial Canal Dehiscence | No of Patients | Percentages |
|-------------------------|----------------|-------------|
| Present | 11 | 36.67 |
| Absent | 19 | 63.33 |

In our study, facial canal dehiscence was present in 11 patients (36.67%).

Table 14: Labyrinthine Fistula

| Labyrinthine Fistula | No of Patients | Percentages |
|----------------------|----------------|-------------|
| Present | 7 | 23.33 |
| Absent | 23 | 76.67 |

In our study, labyrinthine fistula was present in 7 patients (23.33%).

Table 15: Distribution of Labyrinthine Fistula

| Labyrinthine Fistula | No of Patients | Percentages |
|------------------------------|----------------|-------------|
| Lateral Semicircular Canal | 6 | 85.71 |
| Posterior Semicircular Canal | 1 | 14.29 |

In our study, labyrinthine fistula was found to be common on lateral semicircular canal i.e. 6 patients (85.71%) as compared to posterior semicircular canal i.e. 1 patient (14.29%).

Table 16: Pathology

| Pathology | No of Patients | Percentages |
|--------------------|----------------|-------------|
| Cholesteatoma only | 19 | 63.33 |
| Granulations only | 1 | 3.33 |
| Both | 10 | 33.33 |

Table 17: Postoperative Mastoid Cavity

| Mastoid Cavity | No of Patients | Percentages |
|----------------|----------------|-------------|
| Dry | 25 | 83.33 |
| Discharging | 5 | 16.67 |

In our study, postoperative mastoid cavity was dry in 25 cases (83.33%) and discharging in 5 cases (16.67%).

Discussion

Chronic suppurative otitis media may lead to fearsome complications. Most of these are preventable with timely diagnosis and intervention.

Alford (1980) states that most complications that occur, are caused by chronic ear infections which are amenable to medical or surgical therapy and thereby possibly avoidable. [9] The incidence of such complications is surprisingly high even today especially in a country like ours.

The paucity of funds, lack of tertiary health care facilities in rural areas, illiteracy, lack of health education, malnutrition, lack of awareness of the importance of timely diagnosis and treatment at the primary health care level, along with gross neglect of symptoms by rural masses have all contributed to this. Fairbanks (1981) reported a similar incidence of chronic ear disease in poor Caucasians and American Indians in Kentucky. [10] Even in urban areas the inadvertent use of antibiotics has no doubt led to a decrease in the incidence of surgical mastoiditis, but an increase in complications of chronic suppurative otitis media, due to masking of symptoms and signs of the disease. Alford (1980) seconds this view when he states that one of the major factors leading to the development of complications from suppurative otitis media and mastoiditis is that the therapy administered for ear infections is often not of a sufficient dose level or

for a long enough period of time to eradicate the infection. [9]

The incidence, clinical presentation, intraoperative findings and management protocols of 30 cases were studied. The findings of this study were then compared to earlier published series. In the present study, postaural abscess was the commonest complication and was seen in 46.67% i.e. 14 cases followed by 23.33% i.e. 7 cases of labyrinthine fistula and mastoiditis. This correlates the study of Dubey et al.[11] According to the study by Mostafa et al, the most frequent extra-cranial complication is mastoiditis. [12] The lateral semi-circular canal was the most commonly involved in our study 85.71% which correlates well with that of Ikeda et al, [6] Ahmad et al. (2002), [13] which showed 95% and Gormley et al (1986), [14] which showed 79% patients of labyrinthine fistulae to have involvement of the lateral semi-circular canal. In this study, 80% cases had single complication and 20% had multiple complications. However, in the study done by Dubey et al, 67% had single complication and 33% had multiple complications. [11]

| Complications | Present Study (in %) | Dubey's Study (in %) |
|------------------------|----------------------|----------------------|
| Mastoiditis | 23.33 | 37 |
| Postaural abscess | 46.67 | 37 |
| Postaural fistula | 3.33 | 24 |
| Bezold's abscess | 3.33 | 7 |
| Petrositis | 3.33 | 3 |
| Labyrinthine fistula | 23.33 | 3 |
| Facial Nerve Paralysis | 16.67 | 14 |
| Luc's abscess | 0 | 1 |

The most common age group with complications was 21-30 years which was 30% (9 patients). Males were more commonly affected than females. A male to female ratio of 1.5:1 was seen in our study. Same incidence of 1.5: 1 was noted by Samuel et al (1995). [15] The complications were more commonly seen in low and middle socio-economic groups. According to Mostafa et al (2009), patients in the first three decades of life from low socio-economic group were more commonly associated with complications, but there was no sex preponderance. [12] According to different studies like Dubey et al (2007), Agrawal et al (2005) and Shamboul et al (1992), reported the same age distribution. [2,12,16] A large number of patients in our study were from the low socio economic income group and hence probably unhealthy living conditions contributed to worsening in addition to poor immunity and malnutrition.

The clinical features most commonly seen in extracranial complications patients were otorrhea, decreased hearing, fever, otalgia and post auricular

swelling. The commonest symptoms were otorrhea and decreased hearing, which were seen in all cases. Mills (1991) too has reported hearing loss and otorrhea as the most common symptoms of chronic suppurative otitis media. The most common symptom was a long standing or frequently recurring purulent and malodorous ear discharge as also seen in other studies like Kangsanarak et al (1993) and Schwaber et al (1989), Dubey et al (2007). [11,17,18] The duration of ear discharge is not associated with the number of complications. The postaural swelling was seen in 46.67% (14 cases). Facial weakness was noted in 16.67% (5 cases). Neck swelling was noted in 3.33% (1 case). 23.33% (7 cases) were presented with giddiness. Diplopia was seen in 3.33% (1 case). 66.67% (20 cases) were presented with fever which was varied from mild to high grade.

Hearing loss was noted in all cases of extracranial complications, which varied from mild to severe degree. The conductive hearing loss was seen in 66.67% (20 cases) and 33.33% (10 cases) were presented with mixed hearing loss. The severity of

hearing loss was out of proportion to the severity or duration of symptoms and clinical findings, in many cases which could be due to conduction of sound by the cholesteatoma (Mills, 1991) or granulations. Existence of a labyrinthine fistula was seen in 23.33% cases (7 patients) in which case a sensorineural component of hearing loss was present and the fulminant nature of the infection, which caused complications without corresponding damage of equal severity to the middle ear sound conducting mechanism. Mills in his study in 1991 has reported that the development of adhesions between the tympanic membrane and the stapes or stapes footplate can result in good hearing in some cases, though in others these arrangements are inefficient and are associated with a significant conductive loss. Walby et al (1983) have reported elevated bone conduction thresholds as compared to those on the contralateral side in 87 patients with unilateral chronic suppurative otitis media. [17]

The examination of external auditory canal was showing discharge (56.67%) and aural polyp (26.67%). The otoscopic findings of the tympanic membrane were central perforation (36.67%), attic perforation (36.67%), posterosuperior retraction pocket (23.33%), cholesteatoma (26.67%) and granulations (13.33%). The tympanic membrane was not seen due to presence of the aural polyps. These early signs and symptoms should raise a high index of suspicion for diagnosing impending complications of chronic suppurative otitis media. [18]

In this study, mastoid air cell system was sclerotic in 27 patients (90%) and pneumatic in 3 patients (10%). This is in accordance with studies by Hiranandani and Deshpande, where they examined temporal bones of patients with cholesteatoma and found that sclerosis occurs in the attic region initially and with further extension of the cholesteatoma it spreads to the mastoid bone. [19]

In this study, the bacterial flora study showed pseudomonas aeruginosa 40% (12 patients) as the commonest organism cultured from ear discharge followed by staphylococcus aureus 13.33% (4 patients). Similar results were found with the Mathew et al study and Grewal study. [20,21] *Proteus* and *Pseudomonas* were the most frequently isolated organisms as reported by Ojala et al (1981) and Constable and Butler (1982). [22,23] In our study, 16.67% i.e. 5 patients showed no growth on culture of ear discharge. Rudberg (1948) has reported that if the tympanic membrane

is perforated a culture of the external auditory canal discharge may fail to reveal the proper pathogens in as high as 25% of the cases.

The pathology found in our study was 63.33% (19 patients) with cholesteatoma, 3.33% (1 patient) with granulations and 33.33% (10 patients) with both cholesteatoma and granulations. According to Dubey et al study, cholesteatoma is the most frequent noticed pathology, which correlates with our study. [11]

Intraoperative, the ossicle that was found necrosed in most of our cases was the incus, seen in 73.33% cases (22 patients). Swartz (1984) states that the long process of the incus is the most common site followed by the incus body and the malleus head. [24]

All the patients of extracranial abscesses were treated by draining the pus and started on appropriate antibiotics depending on the smear culture and antibiotic sensitivity report. After the acute phase had subsided the patient underwent a canal wall down tympanomastoidectomy to eradicate the primary disease focus and all of them had an uneventful recovery with no post operative complications. Most of the patients underwent a canal wall down procedure. In the studies by Agrawal et al (2005), Dubey et al (2007) and Mostafa et al (2009), most of the patients underwent canal wall down surgery(2,11,12). Many authors such as Baron (1967) prefer modified radical mastoidectomy because of their wide range of utility and greater margin of safety. Cody and Taylor (1977) have shown the rates of recurrence/residual disease to be as high as 36 percent when the intact canal wall technique is used to treat cholesteatoma. Similar results were reported by Parisier (1989) who showed that patients having a canal-wall-down procedure have been cured of their disease and do not require secondary procedures to remove residual or recurrent cholesteatomas. [25] This correlates with authors Abramson et al (1977), [26] Brown J (1982) [27] and Farrior J (1984) [28] who had discovered that the intact-canal-wall procedure for cholesteatoma is an incomplete operation which may cause continual problems with residual or recurrent cholesteatoma, infection and drainage for the patient. On follow up, 83.33% (25 patients) had a well-epithelialised, dry mastoid cavity after surgery.

Summary

| | Commonest | Common |
|---------------|---------------------------------|--|
| complications | Postaural Abscess | Labrynthine fistula (lateral semi-circular canal)& Mastoiditis |
| Age Group | 21-30 years, Male Preponderance | |
| Symptoms | Otorrhea and Decreased Hearing | |

| | | |
|--------------------|---------------------------------------|--------------------------------|
| Otosopic findings | Central Perforation Attic Perforation | Cholesteatoma |
| Pathology | Cholesteatoma | Cholesteatoma and Granulations |
| Ossicular Necrosis | Incus – Long Process | Incus-body |
| Organisms | Pseudomonas Aeruginosa | Staphylococcus Aureus |
| Hearing loss | Conductive | Mixed |

The duration of ear discharge is not associated with the number of complications.

All the patients of extracranial abscesses were treated by draining the pus under Local Anesthesia and started on appropriate antibiotics depending on the smear culture and antibiotic sensitivity report. After the acute phase had subsided the patient underwent a canal wall down tympano-mastoidectomy to eradicate the primary disease focus. On follow up, 83.33% (25 patients) had a well-epithelialised, dry mastoid cavity after surgery.

Conclusion

The extra-cranial complications of chronic suppurative otitis media pose a great challenge to the otolaryngologist despite its declining incidence. The postaural abscess was the commonest complication. The most common age group with complications was 21-30 years with male preponderance. The duration of ear discharge is not associated with the number of complications. Cholesteatoma and granulation tissue, both are equally responsible for the development of the complications of CSOM. Pseudomonas aeruginosa is the commonest organism found in complications of chronic suppurative otitis media. The canal wall down mastoidectomy is preferred treatment. Thus, early diagnosis and prompt surgical intervention are most important for the decreased morbidity and mortality of these patients.

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