

## Mastoiditis in children

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### Abstract

Fifty-two children with mastoiditis were treated at the Federal Government Services Hospital over a period of 15 years (from 1986 to 2000). The salient feature in these cases was the presence of a post-auricular swelling and mastoid abscess. Extensive cholesteatoma was seen in 80.7 per cent of cases and 19.3 per cent had granulations in the mastoid cavity. Significantly, all patients had a history of chronic ear discharge prior to abscess formation. These children belonged to poor communities, were malnourished and attended hospital in a state of emergency.

The presentation and course of the disease confirms the aggressive and potentially serious nature of the pathology requiring early medical attention in order to avert impending complications. It appears that in our environment acute mastoiditis with abscess formation develops from chronic otitis media and the cholesteatoma. The surgical procedures conducted in these cases were radical and modified radical mastoidectomy.

**Key words:** Infant; Child; Mastoiditis; Cholesteatoma

### Introduction

A retrospective study of 52 children with mastoiditis was conducted at the Federal Government Services Hospital, Islamabad. In the ENT unit of this hospital, the average annual out-patient attendance averages 44 000. Approximately 25 per cent of this total are patients with acute and chronic otitis media. Fifty-two cases i.e. 0.031 per cent presented with acute mastoiditis and required surgery.

Acute mastoiditis may follow acute or chronic otitis media. Palva *et al.*<sup>1</sup> reported 116 cases of acute and sub-acute mastoiditis following acute otitis media. Rosen *et al.*<sup>2</sup> reviewed 69 patients with acute mastoiditis – 16 followed acute otitis media. Rubin and Wei<sup>3</sup> presented 34 cases of acute mastoiditis – eight followed chronic suppurative otitis media. Several reports indicate that the liberal use of antibiotics has reduced the incidence of mastoiditis.<sup>4–6</sup> However, Gliklich *et al.*<sup>7</sup> and Mathews<sup>8</sup> have reported significant mortality and morbidity following mastoiditis.

Of the 52 cases in our study 42 had cholesteatoma, of these eight had post-auricular cutaneous fistulae. Ten cases had granulations and polyps. Post-auricular swelling was the presenting sign in 40 cases. These children came from poor communities; were in a poor state of general health and had suffered recurrent ear discharge for several years. These factors and their association in the development of middle-ear pathologies have also been reported by Prescott and Malan<sup>9</sup> in underprivileged communities.

### Materials and methods

This retrospective study is based on the analysis and management of 52 cases of mastoiditis, who presented at the ENT Department of Federal Government Services Hospital, Islamabad between 1986 to 2000.

Documentation for age, sex, socioeconomic status, previous history and duration of ear discharge; management and surgical findings were analysed. X-rays of the mastoids were available in 34 patients and in 40 patients pus from the initial incision and drainage procedure was sent for bacterial culture. Routine blood examination was carried out in all cases.

### Clinical presentation/management

Clinically, 40 patients presented with a painful swelling behind the pinna that displaced the pinna anteriorly and laterally (Figure 1). Eight cases had a post-auricular discharging sinus (Figures 2, 3). Other presenting complaints included a history of recurrent ear discharge, varying from two years to 10 years, fever, pain and headache.

Following admission, routine management consisted of intravenous antibiotics and incision drainage of the abscess. Exploration of the mastoid in these children was deferred until gross swelling of the tissues had subsided and the general condition of

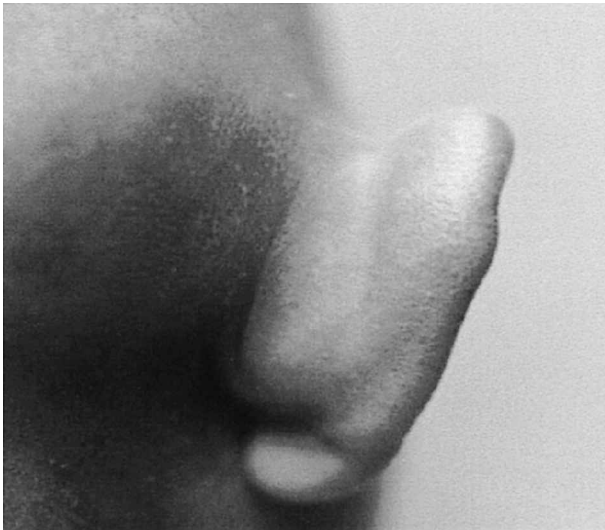


FIG. 1

Post-auricular swelling in an eight-year-old boy.

the patient had stabilized. Five patients being anaemic (haemoglobin ranging from 6 to 9 g/dL) required blood transfusion prior to surgery.

#### *Surgical procedures/findings*

Mastoid exploration was carried out in all cases. In 42 cases removal of mastoid cortical bone exposed cholesteatoma filling the mastoid bowl (Figure 4, 5). Erosion of parts of the bony meatal wall and extension into the tympanic cavity was also evident (Figure 4). The tympanic membrane appeared granular and thickened and there was erosion of major portions of the ossicular chain (Figure 6). Radical mastoidectomy with meatoplasty was completed in these cases. In five cases of cholesteatoma had created a natural mastoidectomy (Figure 5), where evacuation of the cholesteatoma sac left behind a large cavity.



FIG. 2

Post-auricular fistula in a ten-year-old boy.



FIG. 3

Post-auricular fistula with granulations.

In 10 cases the mastoid contained pockets of pus, polypoid mucosa and granulation tissue, blocking the aditus (Figure 7). Modified radical mastoidectomy was carried out in these children. In six of these, it was possible to bridge the malleo-stapedial gap, using the incus remnant (Figure 8).

#### **Results**

The total number of children included in the study was 52 with a mean age of 10.7 years. Twenty-eight (54 per cent) were male and 24 (46 per cent) female. The age distribution is shown in Table I. The main clinical features at presentation are summarized in Table II.

Plain radiographs of the mastoids were available in 34 patients. In 23 (68 per cent) cases the mastoids were well pneumatized but cloudy. In six (17 per cent) cases the mastoids were sclerotic and in five (15 per cent) cases there was cavitation in the mastoid. Bacteriology reports from the initial incision and

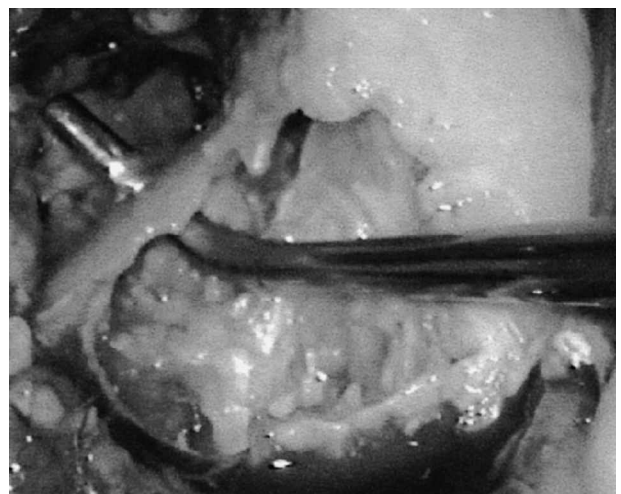


FIG. 4

Probe in posterior bony meatal wall deficiency.

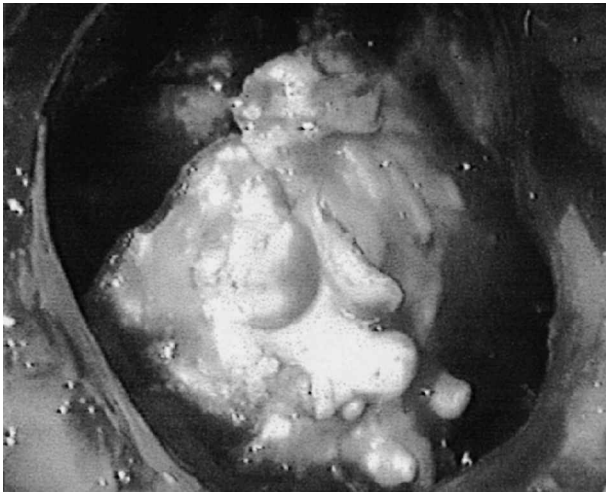


FIG. 5

A natural mastoidectomy created by cholesteatoma.

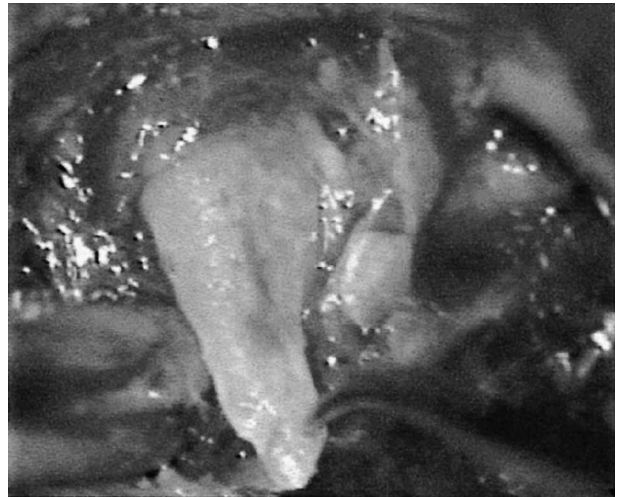


FIG. 7

Eroded lenticular process of Incus.

drainage procedure were available in 40 cases. The most frequently isolated pathogens were *Pseudomonas* species, *Escherichia coli*, *Proteus sp* and *Staphylococcus aureus*.

Open cavity radical mastoidectomy was carried out in 42 (80.7 per cent) cases and modified radical mastoidectomy in 10 (19.3 per cent) cases. Of the 52 patients, 42 (80.7 per cent) had cholesteatoma at exploration, and 10 (19.3 per cent) had granulations and polypoid mucosa in the mastoid cavity (Table III). Ossicular erosion was evident in 48 (92 per cent) cases; the incus being the most frequently involved ossicle (Table IV).

*Surgical outcome*

Complete recovery was seen in 33 (63.5 per cent) cases. However, early (two to four weeks) complications were seen in 19 (36.5 per cent) cases. Eight patients reported imbalance or vertigo. Four patients with fistulae developed wound infection, which

healed in two to four weeks following local dressings and antibiotics. Discharging mastoid cavities were noted in four cases and infection persisted in three cases where ossiculoplasty was carried out.

**Discussion**

Both acute and chronic mastoiditis are potentially serious diseases because of the complications caused by progressive osteitis and bone erosion. At the onset of infection acute inflammation of the middle ear also involves the mastoid air cells by blocking the narrow channels of ventilation – the aditus. In a histopathological study of 229 temporal bones, Paparella and associates<sup>10</sup> concluded that obstruction of the aditus ad antrum leads to significant pathological changes in the development of otitis media and mastoiditis. Exudates accumulate following blockage of the aditus. Pressure of the purulent exudates and osteoclastic activity (Palva *et al.*<sup>1</sup>)



FIG. 6

Probe in aditus with granulations.



FIG. 8

Ossiculoplasty with a sculptured Incus.

TABLE I  
AGE DISTRIBUTION

Range	Number (n = 52)	Percentage
0-5 years	2	4
6-10 years	23	44
11-15 years	27	52

break the thin bony septa in the mastoid leading to complications, such as a subperiosteal abscess.<sup>2,11</sup>

In our clinics patients are seen with a history of ear discharge of several years duration and large fluctuant mastoid swellings. This scenario is common in our hospitals, where patients come from poor communities, most are malnourished and anaemic and in a poor state of general health. Although it would be difficult to link each aetiological factor to the pathogenesis of otitis media, several authors report that a low socio-economic status is one of the major contributing factors in the development of otitis media. Reports by Kwan<sup>12</sup> from Korea and Prescott and Malan<sup>9</sup> from South Africa emphasize the high prevalence rates of otitis media in underprivileged communities.

Also of interest are reports from the West where mastoiditis is frequently seen following a short history of acute otitis media.<sup>3,13-15</sup> In other reports from the West early medical care, improved diagnostic facilities and extensive use of antibiotics seem to have reduced the incidence and development of otitis media and its complications.<sup>4-6</sup> Despite these developments, Mathews<sup>8</sup> has reported complications resulting from acute mastoiditis. In that report 82.1 per cent had sub-periosteal abscess and 23.2 per cent had intra-cranial sepsis. In our series 77 per cent cases presented with subperiosteal abscess and 15 per cent with fistulae. Similar findings have been reported from South Africa<sup>16</sup> and Thailand.<sup>17</sup>

In our study all the patients were children with a mean age of 10.7 years. The youngest being three years and the oldest 15 years. Reports from the developed countries have also emphasized the propensity of middle-ear disease in children. Weit<sup>18</sup> found that an initial attack of acute otitis media reaches its peak prior to the age of two. Kaplan *et al.*<sup>19</sup> in a study of Eskimo children reported that 78 per cent had their first episode of otitis media during the first two years of life.

The presence of extensive cholesteatoma at a very young age is significant. Aetiologically, the history of several years of ear discharge could be one factor, lending support to Portmann's theory<sup>20</sup> of epidermal cell migration from the deep meatal skin into the middle ear spaces. Palva,<sup>21</sup> in his observations on chronic inflammatory middle-ear disease, has stated

TABLE II  
CLINICAL PRESENTATION

Clinical presentation	Number (n = 52)	Percentage
Post-aural swelling	40	77
Pyrexia	35	67
Cutaneous fistula	8	15
Aural polyps	5	10

TABLE III  
SURGICAL FINDINGS

Pathology	Number (n = 52)	Percentage
Cholesteatoma	42	80.7
Ossicular erosion	48	92
Granulations	10	19.3
Meatal polyps	5	10

that granulation tissue, small polypoid mucosal changes and stagnant secretions in the posterior tympanum also pave the way for ingrowths of squamous epithelium. Sade and Shatz<sup>22</sup> suggest that the majority of cholesteatomas in children originate in retraction pockets associated with negative tympanic pressure. Schuknecht<sup>23</sup> states that 'children with keratoma frequently have extensively pneumatized temporal bones, so that epidermal ingrowths may extend deeply into cell tracts'. This is in concurrence with reports by Sanna and Zini *et al.*<sup>24</sup> emphasizing the aggressive nature of cholesteatoma in children with cellular mastoids. Our findings are similar to these reports. In 23 (68 per cent) cases the air cells were well pneumatized but cloudy. Cavitation was seen in five (11 per cent) of cases.

Bacteriology reports were available in 40 cases. *Pseudomonas aeruginosa*, *Proteus* and *Staphylococcus aureus* were frequently isolated, signifying that in our cases mastoiditis followed chronic otitis media. Cohen-Karem *et al.*<sup>25</sup> have reported similar findings.

Extra-cranial and intra-cranial complications resulting from cholesteatoma have been reported in several studies.<sup>16,17</sup> These include mastoiditis, subperiosteal abscess, facial nerve paralysis, post-auricular fistula, meningitis, labyrinthitis, intra-cranial abscess and lateral sinus thrombosis. In our study 77 per cent cases had subperiosteal abscess and 15 per cent had cutaneous fistulae. In five (10 per cent) of cases cholesteatoma had created a natural mastoidectomy. Ossicular erosion was evident in 92 per cent of the cases; the incus being most frequently involved. There was no intra-cranial extension of pathology in this series.

Our hospital is a major ENT centre serving a wide catchment area. Patients are referred from remote areas and have poor compliance for regular follow-up. Eradication of disease thus becomes a priority. It was, therefore, considered expedient in the cholesteatoma cases to carry out radical mastoidectomy. Modified radical mastoidectomy was carried out in cases with granulations and polyps. In six of these, reconstructive tympanoplasty was carried out. The malleo-stapedial gap was bridged by interposing the available incus.

TABLE IV  
OSSICULAR EROSION

Ossicles	Number (n = 48)	Percentage
Incus (lenticular process)	31	64.5
Incus and stapes arch	12	25
Malleus	5	10.5

## Conclusion

Mastoiditis with post-auricular abscess is an otological emergency common in our hospital. Lack of adequate otological diagnostic facilities at the primary care level, poor nutritional status, and low socioeconomic status seems to be the predominant factors in the causation of otitis media and its impending complications, which could otherwise be prevented.

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