

# Management of Otogenic Intracranial Complications

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**Otogenic intracranial complications are dreadful sequel of chronic middle ear infection. Most of the complications follow chronic suppurative otitis media (CSOM), although there is increasing trend towards intracranial complications due to acute suppurative otitis media (ASOM). Warning symptoms of ear pain, vomiting, headache, fever, and altered consciousness in patients with otitis media should be dealt as an emergency. CT scan is the most relevant investigation in establishing the diagnosis and follow up. Extradural abscess is the commonest intracranial complication. Most of the patients underwent surgery and neurosurgical procedure takes precedence over ear surgery. Mortality rate was 5.7%.**

**Keywords: Otitis media, intracranial infection, complications.**

The existence and treatment of intracranial complications dates back to 500 years BC. It is well known that prehistoric man performed trephining or surgical opening of skull, for such infections. Until the 1940s the outlook for these patients remained grim, with a mortality of 75%. However, the introduction of penicillin by Fleming drastically changed this, decreasing mortality to 10%.

Purulent infections of the middle ear and mastoid still occur even with broad-spectrum antibiotics.<sup>1</sup> These complications are still surprisingly common and can be associated with extension and involvement of other adjacent structures. In a recent study that followed more than 1400 patients with chronic suppurative otitis media for 15 years found 7.5% of patients developing intracranial complications.<sup>2</sup> Many of the patients have a history of chronic ear infections. Although recently, an increase in complications secondary to acute middle ear infections is noticed.<sup>3</sup> Patients who are immunocompromised are more prone to serious extension of local temporal bone infections.

Extension of primary temporal bone infection into dural spaces can lead to extradural, subdural infections or brain abscess. Infection can also involve the dural sinuses, leading to thrombosis and secondary brain venous infarction.

Plain X rays of mastoid and middle ear are quite nonspecific. There is usually associated opacification of the middle ear and mastoid, either with or without bone destruction. CT scan is a more sensitive technique for the evaluation of intracranial pathology.<sup>4</sup> Identification of air within a ring-enhancing lesion is very suggestive of an abscess. MRI can also be advantageous, particularly in the evaluation of secondary involvement of adjacent structures.

Modern management of intracranial complications requires high index of suspicion and close collaboration between Otorhinolaryngologist and Neurosurgeon.<sup>5</sup> Management is neurosurgical initially, in a neuroscience's until till the patient is stable.

Otological surgery is next under taken when the patient is fit for surgery.

## Patients and methods:

This series is a retrospective review of records of 52 cases of otitis media with intracranial complications. These patients either presented primarily or had been referred to the Department of ENT Sir Ganga Ram Hospital, Lahore, and Department of ENT Lahore General Hospital, Lahore.

The period of this study spans from January 1998 to December 2002. During this period, 52 patients of otogenic intracranial complication were managed at these two departments. In 44 patients the intracranial complication was secondary to chronic suppurative otitis media and 8 patients had intracranial pathology secondary to acute middle ear infection.

Thirty six of our patients were male and 16 female. The age of patients ranged between 12 and 35 years. All patients presented with history of ear discharged and decreased hearing. Other symptoms pointing towards intracranial extension of middle ear infection included headache, fever, vomiting, and pain in ear and altered consciousness (Table-1). 44.2% patients had extradural abscess, 21.1% had temporal lobe abscess, 17.3% had cerebellar abscess followed by meningitis in 11.5% of cases.

Patients with these warning symptoms were subjected to CT scan. CT scan was carried out in all of our 52 patients. CT scan showed pathology in most of the cases.

Immediate treatment was started with at least three antibiotics. A combination of Benzyl Penicillin, Metronidazole, and Cefotaxime or Gentamicin was used in most patients. Other medicines used included Mannitol, Steroids, and Anti-epileptic drugs. These were prescribed by a neurosurgeon where their use was indicated. All patients were managed in collaboration with Neuroscience's department. In 19 patients neurosurgical procedure was carried out to drain



intracranial abscess. 44 patients underwent otological surgery after the intracranial infection was managed.

All patients were followed for a minimum of 6 months. A complete otorhinolaryngological and neurological evaluation was carried out on each visit.

**Results:**

A total of 52 cases were studied, of these 44 presented with history of chronic suppurative otitis media and 8 presented with history of acute suppurative otitis media. There were 36 males and 16 females. The age range in our patients was between 12 and 35 years. All patients had history of ear discharge and decreased hearing. Other symptoms included headache, fever, vomiting, pain ear, and altered consciousness (Table-1). The opposite ear was normal in most of the patients.

The most common complication was extradural abscess (Table-2) in 23 patients (44.2%). Next in frequency was temporal lobe abscess present in 11 patients (21.1%) followed by cerebellar abscess in 09 patients (17.3%). Meningitis was seen in 06 patients (11.5%). Lateral sinus thrombosis, subdural abscess, and otitic hydrocephalus was seen in one patient each.

All patients underwent CT scan, to confirm the diagnosis and to localize the lesion. In 50 of the 52 patients CT scan showed intracranial pathology, and in 2 patients no pathology was seen on scan, these two patients had meningitis, which was diagnosed on lumbar puncture and subjecting cerebrospinal fluid for cell count, biochemistry, gram staining and culture.

Culture and sensitivity was performed on ear discharge and cerebrospinal fluid and also pus from abscess where present. In majority of cases no growth was obtained. Pus from ear discharge revealed Pseudomonas and Staphylococcus in most of cases. Proteus, in addition to the above mentioned organisms were recovered in pus from brain abscess.

All patients were treated initially with a combination of at least three antibiotics. These included Penicillin, Metronidazole, and Cefotaxime or Gentamicin. These antibiotics were continued for at least three weeks.

Table 1. Presenting complaints (n=52)

Ear discharge	52
Decreased hearing	52
Headache	44
Fever	13
Vomiting	33
Pain ear	33
Altered consciousness	5
Vertigo	5
Focal neurological symptoms	5

Table 2. Otogenic intracranial complications (n=52)

Complications	n=	%age
Extradural abscess	23	44.2
Subdural abscess	01	1.9
Temporal lobe abscess	11	21.1
Cerebellar abscess	09	17.3
Meningitis	06	11.5
Lateral sinus thrombosis	01	1.9
Otitic hydrocephalus	01	1.9

In the surgical management, Neurosurgical intervention preceded over otological surgery. A total of 19 patients (36.5%) underwent neurosurgical procedure by the neurosurgical department. In 17 patients burr hole aspirations were carried out and in 4 patients' craniotomy and excision of abscess was done. In two patients primary craniotomies and excision of abscess capsule were initially treated by burr hole aspiration. In one patient a small temporal lobe abscess was managed conservatively by the neurosurgeon. Intravenous antibiotics managed this, and repeated CT scan evaluation to monitor the decreasing size of the abscess.

In 44 patients otological procedures were performed in our series. In 93.1% patients Radical mastoidectomy was done (41 patients). Of these patients three were treated initially by cortical mastoidectomy, and needed a more radical procedure as the condition did not resolve. In three patients suffering from acute suppurative otitis media cortical mastoidectomy was performed and patients were all right.

Two patients presenting with meningitis had a short history of acute suppurative otitis media and did not need any form of mastoid surgery. These patients recovered without any sequelae.

The mortality rate in our series was 5.7%. One patient who died was suffering from meningitis secondary to chronic ear disease. Other two were suffering from brain abscess.

Follow up was available for a minimum of 6 months. A dry cavity was achieved in most of the patients who were available for follow up. Some patients required long term frequent suction clearance and local antibiotic drops.

**Discussion:**

Intracranial extension of middle ear disease is the most devastating complication associated with otitis media. Otitis media is one of the most common medical illnesses in childhood.<sup>6</sup> The advent of antibiotics has clearly changed the management of otitis media<sup>7</sup>, especially as compared to 1950 and 60s.<sup>8</sup> Previously a surgically treated entity, otitis media is now primarily managed medically.



Intracranial complications can follow acute or chronic ear disease; it is commonly associated with chronic ear disease.<sup>9</sup> Acute middle ear inflammation settles in most cases with out leading to these complications but chronic ear disease, especially cholesteatomatous chronic suppurative otitis media<sup>10</sup> is more often associated with intracranial complications. In our study 84.6% of intracranial complications were due to chronic suppurative otitis media and the remaining were due to acute suppurative otitis media. Ellen<sup>11</sup> reports similar figures. The complications due to acute suppurative otitis media are on a rise<sup>11</sup>. The rise in complications due to acute suppurative otitis media, which is commonly seen in children<sup>12</sup>, can be due to lack of a well-developed immune system and difficulties in diagnosing acute suppurative otitis media in young children<sup>13</sup>.

There is male to female preponderance in our series. Nune<sup>14</sup> and Rafiq Khan<sup>15</sup> have also noted this fact. This can be attributed to our socio-cultural setting where more male than female patients are seen in hospitals. Probably this is not the only reason.

A high index of suspicion is mandatory in order not to overlook this serious complication of otitis media<sup>16</sup>. Presence of persisting symptoms like fever, headache, vomiting, pain in ear, and altered consciousness should be dealt with caution, as these can be due to complication of middle ear inflammation<sup>16</sup>.

In our study most common complication of ear disease was extradural abscess. Most studies report meningitis to be the commonest complication of middle ear disease<sup>17,18</sup>. Osma has reported meningitis and brain abscess to be equally common<sup>19</sup>. In our study temporal lobe abscess is common than cerebellar abscess.<sup>18</sup> Most people share similar experience except a few studies. In all our patients CT scan was carried out on the basis of suspicious symptoms. CT scan is reliable in confirming the diagnosis of intracranial extension of disease<sup>20</sup> and localizing it even at very early stages<sup>21</sup>. MRI has emerged as a more sensitive radioimaging technique. Lack of irradiation, better tissue characterization, increased sensitivity and less toxic contrast agent are the advantages of MRI.

The early use of antibiotics is the mainstay in the treatment of otogenic intracranial complications. We used a combination of Benzyl Penicillin, Metronidazole and Gentamicin or Cefotaxime. Recently third generation cephalosporins, are more in use because of their safety and broader spectrum and particularly because of their penetration in brain tissue is enhanced, especially after pus has been aspirated<sup>22</sup>.

Most of our patients were treated by antibiotics and burr hole aspiration. Others have criticized this view, as there is chances of recollection of pus as the abscess capsule is still there and repeated aspiration

traumatizes the inflamed brain tissue and spreads cerebritis. In our patients craniotomy and excision of abscess capsule was reserved for those cases where after aspiration, abscess did not decrease in size or patients condition deteriorated. Excision is simple with the removal of mass and septic foci at the same time. Arguments against excision state that this is technically difficult and such major surgery is risk to sick patients. Some units utilize continuous irrigation of abscess cavity with antibiotic solution.<sup>23</sup> This technique has additional effect of mechanical cleansing. In one of our patient, a small temporal abscess was treated conservatively,<sup>24</sup> by antibiotics and monitored by CT scan. This has been reported by Buczek<sup>24</sup> and Paffetti<sup>25</sup>, as a reasonable way to treat otogenic abscesses along with monitoring of decreasing size of abscess by CT scan.

The type of ear surgery depends on the ear pathology. Radical mastoidectomy was carried out in most of our patients. This was due to the nature of disease in ear, as most of our patients harbored cholesteatoma alone or in combination with granulations. In pre-antibiotic era radical mastoidectomy was recommended in all cases of intracranial complications. Now the opinion favors that, radical mastoidectomy is unwarranted in non-cholesteatomatous ears even with an otologic intracranial complication. In two of our patients with meningitis secondary to acute suppurative otitis media, once the complication settled no surgical treatment of ear was required and patients recovered completely. Therefore it is the use of antibiotic and not the radical surgery that has reduced the mortality of this disease. Recently Kurien, has recommended craniotomy and mastoidectomy during single anesthesia, but this has not recorded by others<sup>26</sup>.

The mortality in our patients was 5.7%; it is one of the better one than those reported in literature so far<sup>27</sup>. We attribute this to the high index of suspicion<sup>28</sup> and early use of large doses of multiple antibiotics and close collaboration between the neurosurgeon and otorhinolaryngologist.

Our patients were followed for a minimum of 6 months and underwent complete neurological and otorhinolaryngological evaluation at each visit, to rule out residual or recurrent disease. Most of our patients recovered with a dry mastoid cavity, although a few required multiple visit for suction clearance and local antibiotic drops.

#### Conclusion:

- There is increasing trend again of intracranial complication due to ASOM, probably because mild acute infections of ear are not dealt with delegece.



- Ear discharge along with fever, vomiting, otalgia, headache and altered consciousness should be considered as otologic emergency.
- CT scan is the front line tool in the diagnosis of intracranial extension of middle ear disease.
- Antibiotics should be started as early as possible, in right combination, in full doses, and should be used over prolonged period of time.
- Neurosurgical procedure if indicated takes priority over otologic surgery.

**References:**

1. Samuel Julian et al. Intracranial Otogenic Complications: A persisting problem. *Laryngoscope*, march 1986; 96:272-278.
2. Maksimovik Z, Rukovanjski M. intracranial complication of cholesteatoma. *Acta Otorhino Laryngologica Belgica*. 1997; 47: 33-36.
3. Grigor'ev GM, Zagainova NS, Ternovoi AV: Otogenic intracranial complications in an Urban emergency service hospital. *Vestn Otorinolaringol*, 1990; (6): 65.
4. Schwaber K, Mitchell et al. The early signs and symptoms of neurotologic complications of chronic suppurative otitis media. *Laryngoscope*. April 1989; 99:373-375.
5. Mathews TJ. Otogenic intradural complications. *The Journal of Laryngology and Otology*. February 1988; 102: 121-124.
6. Teela DW, Klein JO, Rosher B, et al.: Epidemiology of otitis media during the first seven years of life in children in Greater Boston. *Journal of Infectious Diseases*, 1989; 160: 83-99.
7. Nissen AJ: Intracranial complication of otogenic disease. *American Journal of Otology*, 1980; 2(2): 164.
8. Gadzhimirzaev GA: Otogenic intracranial complications-current assessment of some aspects of the problem. *Vestnik Otorinolaringologi*, 1999; (3): 22.
9. Habib RG, Girgis NI, Abuel Ella et al.: Intracranial infections of otogenic origin. *Journal of Tropical Medicine and Hygiene*, 1988; 91(2): 83-86.
10. V Rupa, R Raman: Chronic versus Uncomplicated disease. *Acta Otolaryngol (stockh.)*, 1991; 111: 530-535.
11. Ellen M Friedman et al.: Central nervous system complication associated with Acute otitis media in children. *Laryngoscope*, 1990; 100: 149-151.
12. Nunez DA: Aetiological role of otolaryngological disease in paediatric intracranial abscess. *Journal of Royal College of Surgeons, Edinburgh*, 1992; 37(2): 80.
13. Dhooge IJ, Albers FW, Van Cauwenberge PB: Intratemporal and intracranial complications of acute suppurative otitis media in children-renewed interest. *International Journal of Paediatric Otorhinolaryngology*, 1999; 49 suppl. 1: S109-S114.
14. Nunez DA and Browning GG: Risk of developing an otogenic intracranial abscess. *Journal of Laryngology and Otology*, 1990; 104(6): 468-472.
15. M Rafiq Khan et al.: Otogenic brain abscess. *Pakistan Journal of Otolaryngology* 1986; 2: 140-143.
16. Albers FW: Complications of otitis media-the importance of early recognition. *American Journal of Otology*, 1999; 20(1): 9-12.
17. PSN Murthy et al.: Otogenic brain abscess in childhood. *International Journal of Paediatric Otorhinolaryngology*, 1991; 22: 9-17.
18. Perez Obon J, Fernandez Liesa R, Marin Garcia et al.: Cerebral abscess as a complication of chronic otitis. *Acta Otorrinolaringol Esp*, 1994; 45(2): 107-110.
19. Osma U, Cureoglu S, Hosoghi S: The complication of chronic otitis media. *Journal of Laryngology and Otology*, 2000; 114: 97-100.
20. Shanley DJ and Murphy TF: Intracranial and Extracranial complication of acute mastoiditis-evaluation with Computed Tomography. *Journal of American Osteopathic Association*, 1992; 92(1): 131-134.
21. Derbeneva ML: clinical picture and treatment of initial symptoms of otogenic intracranial complications. *Vestnil Otorinolaringologii*, 1999; 3: 26-30.
22. Masaaki Yamamoto et al.: Penetration of intravenous antibiotics into Brain abscess. *Neurosurgery*, 1993; 33: 44-49.
23. Asim Mehmood, Raul M Abad and John H Updegrave: Brain abscess treated by continuous antibiotic perfusion-Technical note. *Neurological Research*, 1993; 15: 63-67.
24. Buczek M, Jagodzinski Z, Goraj B: A case of favorable outcome of conservative treatment of acute otogenic cerebellar abscess. *Neurol Neurochir Pol*, 1989; 23(2) 153-156.
25. Paffetti A, D'Aviera L, Le Foche F et al.: Successful meropenem therapy of a brain abscess and meningitis arising from acute purulent otomastoiditis-Case report. *Journal of Chemotherapy*, 1998; 10(2): 132-135.
26. Kurien M, Job A, Mathew J et al.: Otogenic intracranial complications-Concurrent craniotomy and mastoidectomy-Changing trends. *Archives of Otolaryngology and Head and Neck Surgery*, 1998; 124(12): 1353-1356.
27. Jaran Kangsanarak et al.: Extracranial and intracranial complications of suppurative otitis media. Report of 102 cases. *The Journal of Laryngology and Otology* 1993; 107: 999-1004.
28. Deric D, Dordevic V, Durovic B: a quite clinical course in an otogenic brain abscess. *Med Pregl* 1999; 52(11-12): 505-50