

Lal Kishor Yadav
Prakash Bahadur Thapa
Jayendra Pradhananga

Department of ENT-Head & Neck
Bir Hospital, National Academy of
Medical Sciences, Kathmandu, Nepal

Corresponding Author:
Dr. Lal Kishor Yadav

Department of ENT-Head & Neck
Bir Hospital, National Academy of
Medical Sciences, Kathmandu, Nepal

Email: lalkydv@hotmail.com

OTOGENIC INTRACRANIAL COMPLICATIONS IN BIR HOSPITAL; AN EIGHT YEARS RETROSPECTIVE REVIEW

Objectives:

To review our experiences on intracranial complications secondary to otitis media and to compare the results with other studies.

Material and Methods:

A retrospective chart review of all patients with intracranial complications secondary to otitis media over eight years period in Bir hospital was done. Clinical presentation, radiological findings, microbiology, surgical management and antibiotics used were studied.

Results:

Forty eight cases were included in this study of which 23 had meningitis, 15 had brain abscess, 7 had lateral sinus thrombosis and 3 had petrositis. 37 of these were secondary to chronic otitis media and 11 were secondary to acute otitis media. Otorrhoea, headache, earache, fever, vertigo and vomiting were the main symptoms. Staphylococcus aureus was the most common bacteria isolated followed by Pneumococcus, Haemophilus influenzae and Klebsiella.

Conclusion:

Early recognition, multi drug treatment with broad spectrum antibiotic and multi disciplinary approach are the mainstay of management of otogenic intracranial complications.

Keywords: Brain abscess, Intracranial complication, Neurosurgery.

INTRODUCTION:

Otogenic intracranial complications are very common in developing countries as a result of lack of access to medical facilities or people seeking medical advice late due to ignorance or poverty. The complications can sometimes result in fatal consequences though the mortality has been significantly reduced all over the world, especially in developed countries due to development of effective antibiotics. In the pre-antibiotic era, intracranial complications secondary to ear disease occurred in 2.3-6.4 % of cases.¹⁻³ Once a patient developed an intracranial complication such as brain abscess, mortality rates as high as 75 % were commonly reported.^{3,4} With the introduction of antibiotics, sophisticated imaging techniques and refined surgical techniques, intracranial complication rates have been reduced to 0.04-0.15%.⁴⁻⁶ A multidisciplinary approach requiring close collaboration between the general practitioner, otolaryngologist, neurosurgeon, radiologist and microbiologist is needed for the treatment of these complications. Opinions vary in the literature regarding how to prioritize the treatment of patients with brain abscess secondary to otologic disease. Some authors suggest that intracranial surgery should be done first and otologic surgery should be scheduled several days to several weeks later.^{5,7} However, it has been advocated by Singh and Maharaj⁵ that otologic surgery should not be delayed and should be carried out immediately after the neurosurgical procedure under the same anesthesia. Early recognition of symptoms and a team approach to the management of these patients

will help identify the best course of treatment. Aims and objective of this study was to review our experience on intracranial complications secondary to otitis media with special reference to symptoms, signs, microbiological findings and associated complications.

MATERIALS and METHODS:

48 patients who had been treated for intracranial complications secondary to otitis media were enrolled for study. The duration of study was from January 2006 to December 2013. All the patients were treated in Bir Hospital which is the national neurosurgical referral centre. A retrospective chart review was undertaken and the necessary data were recorded on a proforma designed for the study. All the patients underwent thorough neuro-otological examination. Swabs taken from ear discharges and brain abscess were sent for bacteriological study and antibiotic sensitivity. Ear and brain discharge for culture was obtained using a sterile cotton swab which was then sealed and transported to the microbiology laboratory. The specimen was then placed on aerobic culture media within 5-10 minutes after collection. Because of the lack of facilities anaerobic culture was not done. Blood and chocolate agar plates were used for inoculation and isolation of aerobic organisms. The plates were examined after 24 and 48 hours. All patients underwent contrast enhanced computed tomography (CT) of the brain and temporal bones. Twelve patients underwent magnetic resonance imaging (MRI). Two patients also underwent magnetic resonance venography (MRV). The surgical management and choice of antibiotics were then compared to those of other investigators.

RESULTS:

48 patients with intracranial complications were identified. There were 34 males and 14 females, age ranged from 7-78 years. The intracranial complications found in this study were Meningitis (48%), Brain abscess (31.2%), Lateral Sinus Thrombosis (14.6 %) and Petrositis (6.2%). (Table 1) 23 cases of Meningitis were on record. 15 were male and 8 females. They were all treated using the standard antibiotic protocol followed in Bir hospital i.e. Penicillin, Cloxacillin and Metronidazole. All of them were cured. 19 cases were secondary to chronic otitis media and 4 were secondary to acute otitis media.

Table 1: Showing types of Intracranial complications.

Complications	No of patients (n = 48)	Secondary to Acute Otitis Media	Secondary to Chronic Otitis Media
Meningitis	23 (48%)	4	19
Brain abscess	15 (31.2%)	3	12
Lateral Sinus Thrombosis	7 (14.6%)	2	5
Petrositis	3 (6.2%)	2	1
Total	48	11	37

Similarly, 15 cases of brain abscess were found. 12 were secondary to chronic otitis media and 3 were secondary to acute otitis media. All the abscesses were on the same side as the diseased ear. 10 abscess developed in the temporal lobe, 3 in the cerebellum and 2 in the parietal lobe. Two patients died during the course of treatment. The primary presenting symptoms and signs are shown in Table 2.

Table 2: Showing Symptoms and signs of patients

Main presenting symptoms/signs	Occurrence in patients (n=48)
Otorrhoea	38
Headache	27
Earache	21
Fever	26
Vertigo/Nausea	19
Visible Cholesteatoma/ Granulations	16
Congested Tympanic Membrane	9
Seizure	5
Diminished consciousness	4
Hemiparesis	2

Contralateral hemiparesis was seen in 2 patients with brain abscess. Diminished consciousness and seizure were found in 4 and 5 patients respectively. Spiking fever and malodorous otorrhoea were noted in patients diagnosed as lateral sinus thrombosis. Sixth cranial nerve palsy was seen in all 3 patients of petrositis. Culture and antibiotic sensitivity result of the middle ear or mastoid swab is shown in Table 3.

Table 3: Showing most commonly isolated organisms and their antibiotic sensitivity.

Bacteria	No of isolates	Benzyl Penicillin	Amoxy Clav	Ceftriaxone	Ciprofloxacin
Staphylococcus aureus	21	S	S	S	S
Pneumococcus	14	S	S	S	R
Haemophilus influenzae	11	S	R	S	R
Klebsiella	7	R	R	S	R
Pseudomonas aeruginosa	5	R	S	S	R
No Growth	12				

S = sensitive, R = resistant

Staphylococcus was the most frequently isolated organism followed by Pneumococcus. Regarding sensitivity, Ceftriaxone was found to be sensitive for all the organisms cultured whereas Penicillin was found to be resistant to Klebsiella and Pseudomonas and Amoxycylav was found to be resistant to Haemophilus influenzae and Klebsiella. Anaerobic culture was not done due to lack of facilities. CT scan was alone enough to diagnose the intracranial complications in 38 cases. These cases were meningitis and brain abscesses. However, 10 cases needed MRI to confirm diagnosis. Seven of these 10 patients had lateral sinus thrombosis and 3 had petrositis. MRV was done in 2 patients which confirmed lateral sinus thrombosis. All the patients were treated with broad spectrum intravenous antibiotics. 17 patients had multiple bacteria cultured from their ear swabs. Therefore, a combination of the following antibiotics was used: Benzyl Penicillin, a third generation cephalosporin, metronidazole and amoxycylav. 12 patients had modified radical mastoidectomy and 3 had cortical mastoidectomy. The underlying disease was cholesteatoma or granulation tissue in the patients who underwent modified radical mastoidectomy, whereas, in the patients who underwent cortical mastoidectomy it was inflammatory mucosal disease of the middle ear. 10 abscess in the temporal lobe and 3 in the parietal lobe were drained using burr hole technique but abscess in the posterior lobe needed craniotomy. Three patients had the abscess drained and the ear explored under the same anesthesia. 12 patients had the abscess drained first and the ear explored one to two weeks later. Surgical management of lateral sinus thrombosis was done by cleaning of the infected perisinus material and opening the anterior wall of the sinus. The lateral sinus was already eroded by infection in 3 patients. In these patients the infected material was evacuated and the sinus then covered with adjacent muscular flap after which the mastoid cavity was packed with bismuth iodoform paraffin paste pack. Length of hospital stay ranged from 2 to 6 weeks.

DISCUSSION:

This study showed there were 48 cases of intracranial complications secondary to otitis media during an 8 year period treated in this hospital. This is a fairly large number of intracranial complications for the population of Nepal

which will be compared with other studies. It has been observed that mortality from otogenic intracranial complications has decreased gradually from 75% in the pre antibiotic era up to 34% in the immediate post antibiotic era.⁸ Singh and Maharaj⁵ reported a further reduction to 13%. The lifetime risk of a thirty year old person with active suppurative ear disease developing brain abscess has been estimated at 1 in 200.⁹ The high mortality rate associated with otogenic intracranial complication, particularly brain abscess is the reason why definite surgical intervention is needed timely.¹⁻⁷ In our study in thirty seven patients the intracranial complications were due to chronic suppurative otitis media and in eleven they were due to acute otitis media, which is consistent with several other studies.^{1,6,7} Sixty Three percentage of temporal lobe abscess were found to be caused by chronic otitis media and cholesteatoma in the study by Ruggles and Cassady.⁶ Kangsanarak et al⁷ reported 94% of chronic otitis media (with cholesteatoma in 80% of cases) among 87 patients with intracranial complications secondary to otitis media in Thailand. In the study on 100 cases of intracranial complications secondary to active otitis media, Gower and Mc Guirt¹⁰ found meningitis to be the most common complications, reported in 76 patients followed by brain abscess, reported in 6 patients. Likewise, Kangsanarak et al⁷ also reported meningitis to be the most common intracranial complication among 87 patients. Both the above studies are in agreement with our study which also shows meningitis to be the most common complication but contradicts with the study by Hafidh MA¹ which shows brain abscess to be the most common complication. The presenting signs and symptoms were otorrhoea, headache, earache, fever, vertigo, vomiting which were similar to earlier studies.¹¹⁻¹³ Out of the 15 patients with brain abscess, 12 had their abscess drained first and mastoid surgery done 7 to 14 days post neurosurgery. But there was no benefit assessed in delaying the mastoid surgery. In the remaining 3 patients with brain abscess, the abscess was drained and the mastoid surgery was done at the same time. There is strong evidence that early ear surgery reduces mortality.⁵ In their study of 150 patients with intracranial complications, Singh and Maharaj⁵ said that the decrease in mortality in their institution, from 36% in 1986 to 13% in 1993 was largely due to change of neurosurgical treatment policy regarding timing of surgery. They stated that ear surgery should not be delayed but routinely carried out immediately after neurosurgery under the same anaesthesia. Our experience is also in favor of the treatment of ear disease at the same time as drainage of brain abscess. By doing this the necessity for a second surgery is avoided and the source of seedling from infected ear disease is eliminated. In this study the ear surgery performed were modified radical and radical mastoidectomy for diseases with cholestatoma or granulation tissues and cortical mastoidectomy for diseases without cholestatoma or granulations. This is consistent with the current practice of ear surgery as reported by Singh and Maharaj.⁵ *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Staphylococci* were shown to be the predominant organisms cultured from ears with

chronic otitis media by earlier studies.^{7,12} Though anaerobes were not found to play a major role as causative organisms of ear diseases in these studies, a recent study performed in 1999 showed that anaerobes were present in 4 of the cultures obtained from 6 patients with intracranial complications.¹³ Hafidh MA et al also found anaerobes to be the most commonly isolated organism.¹ Anaerobic culture were not done in our study and *Staphylococcus aureus* followed by *Pneumococcus* and *Haemophilus influenzae* were found to be the most common organisms cultured.

Since many studies have shown anaerobic organisms to play a major causative role in suppurative ear disease, metronidazole was used in combination with other antibiotics such as benzyl penicillin, a third generation cephalosporin and cloxacillin as the standard protocol for the treatment of intracranial infection in Bir hospital. Jang and Park¹⁴ found that 88 of 231 patients with chronic otitis media had persistent otorrhoea after a two week course of ciprofloxacin ear drops. On bacteriological study it was revealed that the isolated *P. aeruginosa* was resistant to ciprofloxacin. Hafidh MA et al¹ also found ciprofloxacin to be resistant to anaerobes, *Klebsiella*, *Enterococcus* and *Pseudomonas*. In our study, we also found ciprofloxacin to be resistant to *Klebsiella*, *Pseudomonas*, *Haemophilus* and *Pneumococcus*. Ceftriaxone was found to be sensitive to all the organisms in our study. Since antibiotic resistance has become a major issue in all hospitals, they should be chosen in consult with a clinical microbiologist on an individual patient basis.

CONCLUSION:

It is a challenging task to manage intracranial complications secondary to ear disease. A multidisciplinary approach involving neurosurgeon, otolaryngologist, clinical microbiologist and radiologist is needed for a successful outcome. Significantly high mortality and morbidity rates continue to be reported in international literature. In this report on Nepalese population otorrhoea, headache, earache, fever, vertigo and vomiting are the predominant signs and symptoms. Computed axial tomography, MRI and MRV are the main investigations. All patients should be treated by broad spectrum intravenous antibiotics with adequate anaerobic cover. After the culture sensitivity reports are available, antibiotics should be tailored to the individual patient.

REFERENCES:

1. Hafidh MA, Keogh I, Walsh RMC et al. Otogenic intracranial complications. A 7 year retrospective review. *American Journal of Otolaryngology* 2006;27 (6): 390-95.
2. Doves JD. Complications of infection of middle ear. Scott-Brown's disease of ear, nose and throat. 4th ed. London: Butterworths; 1979. p305-84.
3. Palva T, Virtanen H, Makenin J. Acute and latent mastoiditis in children. *J Laryngol Otol*.1985;99:127-36.
4. Myers EN, Ballantine HT. The management of otogenic brain abscess. *Laryngoscope*. 1965;75: 273-88.
5. Singh B, Maharaj TJ. Radical Mastoidectomy: its place in otitic intracranial complications. *J Laryngol Otol*. 1993;107:1113-8.
6. Ruggles RL, Cassaday C. Otitic temporal lobe abscess. *Laryngoscope*. 1965;75:1259-67.

7. Kangsanarak J, Navacharoen N, Foanant S et al. Intracranial complications of suppurative otitis media: 13 years experience. *J Otolaryngolog*. 1995;16:104-9.
8. Ballantine HT, White JC. Brain abscess: influence of antibiotics on therapy and mortality. *N Engl J Med*. 1953;248:14-19.
9. Nunez DA, Browning GG. Risk of developing an otogenic intracranial abscess. *J Laryngol Otol*. 1990;104:468-72.
10. Gower D, McGuiert WF. Intracranial complications of acute and chronic infectious ear disease: a problem still with us. *Laryngoscope*. 1983;93:1028-33.
11. Samuel J, Fernandes CMC, Steinberg JL. Intracranial otogenic complications: a persisting problem. *Laryngoscope*. 1986;96:272-78.
12. Kangsanarak J, Fooanant S, Ruckphaopunt K. Extracranial and intracranial complications of suppurative otitis media: report of 102 cases. *J Laryngol Otol*. 1993;107:999-1004.
13. Syms MJ, Tsai PD, Holtel MR. Management of lateral sinus thrombosis. *Laryngoscope*. 1999;109:1616-20.
14. Jang CH, Park SY. Emergence of ciprofloxacin resistant pseudomonas in chronic suppurative otitis media. *Clin Otolaryngol*. 2004;29:321-3.

