

Simultaneous Management of Orogenic Brain Abscess and Suppurative Otitis Media: Retrospective analysis

Intracranial complications of Chronic Suppurative Otitis Media (CSOM) are common. Brain abscess is the commonest intracranial complication. Traditionally, life threatening brain abscess was managed first and the causative otitis dealt later. However, with the aim of dealing with both at the outset, we have started treating these problems in the same anesthesia setting. Retrospective analysis of the consecutive patients treated simultaneously is presented.

Key Words: Brain abscess, chronic suppurative otitis media, simultaneous surgery

Original Article

Ram K Shrestha, MS

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Gopal Sedain MS, MCh

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Mohan R Sharma, MS

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Sushil K Shilpakar MS

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Amit B Pradhananga MS, MCh

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Prakash Kafle, MS

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Binod Rajbhandari, MS

Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal

Address for correspondence:

Gopal Sedain, MS, MCh
Neurosurgery Unit, Department of Surgery
IOM, TUTH, Kathmandu, Nepal
Email: newron79@gmail.com

Received, 11 April, 2016

Accepted, 23 April, 2016

Chronic Suppurative Otitis Media (CSOM) is a common disease in developing country like Nepal with a prevalence of around 5%.^{1,7} Intracranial complications of CSOM include meningitis, brain abscess, sigmoid sinus thrombosis, as well as subdural and extradural empyema. Out of 300 patients studied at TUTH (Kathmandu), the incidence of intracranial suppuration was 5%.¹⁸ Surgery is the mainstay of treatment for intracranial abscess.¹⁶ In a study done at CMC (Vellore, India), out of 157 patients with brain abscess 23% had an otogenic origin.¹⁶ Similarly in a study done at TUTH, Kathmandu by Mohan Sharma, out of 50 pediatric patients with brain abscess 15 patients (30%) had otogenic source.¹⁵ There are various routes of middle ear infections reaching the cranial cavity. It can be directly by eroding the bone, hematogenous route or metastatic. Our study retrospectively analyzed clinical data and simultaneous surgical management of otogenic intracranial suppuration and otitis media.

Materials and Methods

This study is a retrospective review of the patients operated for CSOM and intracranial suppuration of 2-year duration from the year July 2013 to June 2015. Nineteen patients were identified with intracranial suppuration attributed to ear pathology. Patient characteristics, imaging features, microbiology, surgical procedures, operative time, complications and outcome were assessed.

Management protocol

Clinical findings are noted and a CT head with contrast scan is done. A CT of the middle ear is also performed as required by the ENT team. ICP lowering agents are used (mannitol/dexamethasone) till surgical intervention and steroids are tapered in a week and stopped. Antiepileptics are instituted for all supratentorial abscesses for a minimum of 1 month and continued in patients with seizures for a period of 2 years. Burr hole drainage is the routinely

Shrestha et al

performed procedure after marking the operative site on the CT scan. After drainage, obtained sample is sent for gram stain and culture sensitivity. Anaerobic culture is not performed due to unavailability. Patients are treated with triple broad spectrum antibiotics which include Vancomycin, Ceftriaxone and Metronidazole for 6 weeks, unless we have a bacterial culture which has sensitivity to other antibiotics.

A CT head is performed a week later and every two weeks after that. CT is performed in between if the patient has fall in GCS by 2 points. Repeat aspiration is performed if the size of the abscess increases or remains same.

Results

There were 13 male and 6 female patients. The mean age was 16.89 years with age range from 2 to 32 years. Eighteen patients had active ear discharge with otologic diagnosis of CSOM and one had AOM with Mastoiditis. There were total 23 suppurative complications in those 19 patients (Table 1). Multiple suppurations were found in 3 patients. One 12 year female patient had triple suppuration - epidural empyema, subdural empyema as well as cerebellar abscess. Two patients had double suppurative lesions. One patient with bilateral CSOM had temporal abscess as well as interhemispheric empyema. Temporal lobe was found to be involved more often than cerebellum.

Intracranial Suppurations	Numbers	Percentage
Temporal Abscess	13	56.52
Cerebellar Abscess	6	26.08
Subdural Empyema	2	8.69
Epidural Empyema	1	4.34
Interhemispheric Empyema	1	4.34
Total	23	

Table 1: Locations of intracranial suppurations

Clinical presentation

The most common presentation was ear discharge. Headache was present in 84% of patients. Focal Neurologic deficit mostly in the form of hemiparesis was found in 37%. Fever was present in only 21 % of patients (Table 2).

Symptoms and Signs	Frequency	Percentage
Ear Discharge or history of ear discharge	19	100
Headache	16	84
Hemiparesis/Focal Deficit	7	37
Vomiting	6	31
Altered Sensorium	4	21
Seizure	4	21

Cerebellar Signs	4	21
Fever	4	21

Table 2: Signs and symptoms

Radiological evaluation

Plain and contrast CT scans were performed for radiological diagnosis. The imaging features included the smooth round ring enhancing lesions with hypo density within and surrounding hypo density suggestive of edema. Peripheral enhancing lesions in the subdural and epidural spaces with or without air density suggested empyema in the respective regions. Destruction of middle ear and soft tissue density in the mastoid air cells suggested suppurative otitis media (Figure 1 A, B, C).

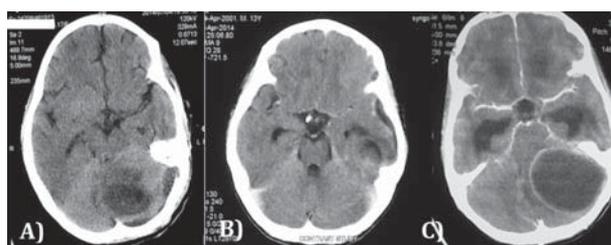


Figure 1: A) Left cerebellar abscess with subdural empyema, B) Left temporal abscess with empyema, C) Large left cerebellar abscess with evidence of Obstructive Hydrocephalus

Surgical intervention

All (n=19) patients had combined surgery done by ENT surgeons and Neurosurgeons under same General Anesthesia. Neurosurgical intervention included Burr-hole aspiration done in majority of cases (n=16). One patient with cerebellar abscess was operated using intra operative Ultrasound guidance. Three patients with multiple suppuration underwent surgical evacuation of the empyema as well as abscess wall excision.

Repeated aspiration of abscess from the previous or new burr hole was required in 11 patients. Three patients had aspiration done 3 times and one patient required 4 aspirations. The re-aspiration procedures were all done under local anesthesia. The patients with surgical evacuation and abscess wall excision did not require repeated surgery.

Procedures	Frequency
Burr hole aspiration including reaspirations	30
Surgical evacuation/abscess wall excision	3
Modified Radical Mastoidectomy (MRM)	19

Table 3: Types of surgery

Brain Abscess and Suppurative Otitis Media Discussion

Bacteriology spectrum

Microbiological study of the 15 specimen in the form of pus and abscess wall did not show any growth. However, anaerobic culture was not done in any specimen. Mixed growth was noted in 2 samples and Escherichia Coli and Pseudomonas aeruginosa each in 2 samples. The broad spectrum antibiotics were continued for six weeks in all patients. Injectable antibiotics changed to oral form once patients imaging showed no increase in abscess size.

Complications

Thrombophlebitis was the most common complications recorded and was noticed in all patients requiring multiple intravenous accesses during the hospital stay. One child developed intracranial hematoma (**Figure 2**) adjacent to abscess following burr hole aspiration of the abscess. Facial Palsy of Grade 4 developed in one patient following MRM. Minor rashes, probably drug related, were recorded in 5 patients.



Figure 2: Plain CT head of a patient who developed hematoma at the abscess site post drainage (he was managed conservatively)

Operative time

All surgeries were done in Emergency basis. Burr hole drainage of the abscess was done first, followed by mastoid exploration. The average duration of surgery was 4.35 hours (range 3hr to 5 hours).

Outcome

Outcome at 3 months were recorded either from outpatient visit or phone enquiries. All patients had a GOS 5. One patient had residual Facial nerve palsy, otherwise no adverse events or neurologic sequelae were reported.

Brain Abscess comprises around 8% of all Space Occupying Lesions in brain in developing countries.³ Though the complication of Otitis media has decreased due to early identification and management with antibiotics, the intracranial complication is still dreaded due to high morbidity and mortality.^{5, 10} The changing trend of young patients with otogenic intracranial complications is found in our study as majority of the patients were less than 20 years.¹¹

Abscess is the second most common type of intracranial complications of otogenic origin with temporal lobe being the most common site of pathology. The epidural and subdural empyema is less frequent and our observation is in concordance with the literature available.^{5,8,20} The presentation varies in different patients, and all of the classic triad of fever, headache and focal deficit is rarely present. Any features of raised intracranial pressure whether generalized headache or vomiting or focal deficit with or without cranial nerve palsies are to be sought for and inquired upon and imaged to not miss this complications.^{5,13,19} Contrast enhanced CT scan is the mainstay of investigation.⁵

Management of Brain Abscess consists of long term antibiotic therapy combined with some form of surgical drainage.^{4,13,19} We usually employ burr hole aspiration and choose abscess wall excision and evacuation only if craniotomy is required for some other lesions like evacuation of subdural or epidural pathology. It may also be warranted if multiple attempt of aspiration failed to resolve the abscess. Conservative management with antibiotics alone may be tried for small and deep abscess or stereotactically aspirated. Image guidance and endoscopic guidance is being used as well.

Another important aspect of brain abscess is to treat the primary source. A number of studies have shown good result with concurrent abscess drainage and mastoidectomy in the same setting without added morbidity. They have shown less recurrence with the concurrent surgery but without statistical significance.^{6,12} Other procedures being carried out include transmastoid approaches for abscess.⁹

Only 4 of 19 specimen yield culture positivity in our study which is a 21% yield. In a study done in India, only 20% culture growth was noted where as in China only 13% shows organism.^{17,21} These high culture negativity can be explained by the lack of anaerobic culture media and use of antibiotics before the sample being withdrawn. However, metagenomic analysis and nucleotide sequence analysis is being used in some centers to identify the responsible organism and they have been able to identify bacteria that have never been incriminated as a cause for brain abscess.^{2,14}

Complications included minor rashes probably

Shrestha et al

phenytoin related as we commonly use anti-epileptics at least for 1 month and continue if seizure is present. One patient developed hematoma adjacent to aspiration site, which can be explained either by direct injury to the vessel during aspiration or could be the reactive hemorrhage due to rapid decompression of the abscess. These can be managed conservatively depending upon the patient neurological status.

The mortality has decreased significantly for brain abscess with the advent in the diagnosis post CT-era and it has further decreased to a current rate of around 6% in recent decades.²¹ However, preoperative GCS is still the best prognostic factor.^{12, 13, 21} In our study 4 patients presented with drowsiness but they improved significantly after treatment.

Conclusion

Suppurative Intracranial complications is a life threatening condition that frequently occurs due to the high prevalence of CSOM especially in developing countries. High index of suspicion is required for diagnosis. Combined surgical evacuation and antibiotics is required. Concurrent eradication of the brain abscess and primary source can be safely done in the same setting and it may decrease the recurrence rate.

Acknowledgement

We are thankful to the department of ENT for being available for emergency surgeries.

References

1. Adhikari P, Joshi S, Baral D, Kharel B. Chronic suppurative otitis media in urban private school children of Nepal. *Braz J Otorhinolaryngol* 75:669-672, 2009
2. Al Masalma M, Lonjon M, Richet H, et al. Metagenomic analysis of brain abscesses identifies specific bacterial associations. *Clin Infect Dis* 54:202-210, 2012
3. Bhatia R, Tandon PN, Banerji AK. Brain abscess--an analysis of 55 cases. *Int Surg* 58:565-568, 1973
4. Bonfield CM, Sharma J, Dobson S. Pediatric intracranial abscesses. *The Journal of Infection* 71 (Suppl 1):42-46, 2015
5. Krivopalov AA, Yanov YK, Astashchenko SV et al. Features of Otogenic Intracranial Complications at the Present Stage. *Vestnik khirurgii imeni IIGrekova* 174:68-79, 2015
6. Kurien M, Job A, Mathew J, Chandy M. Otogenic intracranial abscess: concurrent craniotomy and mastoidectomy--changing trends in a developing country. *Arch Otolaryngol Head Neck Surg* 124(12):1353-1356, 1998
7. Maharjan M, Bhandari S, Singh I, Mishra SC. Prevalence of otitis media in school going children in Eastern Nepal. *Kathmandu Univ Med J* 4:479-482, 2006
8. Migirov L, Duvdevani S, Kronenberg J. Otogenic intracranial complications: a review of 28 cases. *Acta Oto-laryngologica* 125:819-822, 2005
9. Morwani KP, Jayashankar N. Single stage, transmastoid approach or otogenic intracranial abscess. *J Laryngol Otol* 123:1216-1220, 2009
10. Nesic V, Janosevic L, Stojicic G, Janosevic L, Babac S, Sladoje R. Brain abscesses of otogenic origin. *Srpski arhiv za celokupno lekarstvo* 130(11-12):389-393, 2002
11. Osenbach RK, Loftus CM. Diagnosis and management of brain abscess. *Neurosurg Clin N Am* 3:403-420, 1992
12. Ozkaya S, Bezircioglu H, Sucu HK, Ozdemir I. Combined approach for otogenic brain abscess. *Neurologia medico-chirurgica* 45:82-85, 2005
13. Patel K, Clifford DB. Bacterial brain abscess. *The Neurohospitalist* 4:196-204, 2014
14. Saito N, Hida A, Koide Y, Ooka T, et al. Culture-negative brain abscess with *Streptococcus intermedius* infection with diagnosis established by direct nucleotide sequence analysis of the 16S ribosomal RNA gene. *Internal medicine* 51:211-216, 2012
15. Sharma Mohan R: Management of Pyogenic Brain Abscess in Children: Review of 50 Cases. *Nepal Journal of Neuroscience* 10:61-67, 2013
16. Sharma N, Jaiswal AA, Banerjee PK, Garg AK. Complications of Chronic Suppurative Otitis Media and Their Management: A Single Institution 12 Years Experience. *Indian Journal Of Otolaryngology and Head and Neck surgery* 67:353-360, 2015
17. Singh D, Gupta V, Singh AK, Sinha S. Evolution of otogenic brain abscess and management protocol. *Indian Pediatrics* 38(2):169-173, 2001
18. Thapa N, Shrivastav R P, Amatya R C M, et al. Complications of Chronic Suppurative Otitis Media AA Type-3 Years Experience at TUTH. *J Nepal Med Assoc* 40:77-82, 2001
19. Wanna GB, Dharamsi LM, Moss JR, Bennett ML, Thompson RC, Haynes DS. Contemporary management of intracranial complications of otitis media. *Otol Neurotol* 31:111-1117, 2010
20. Yorgancilar E, Yildirim M, Gun R, Bakir S, Tekin R, Gocmez C. Complications of chronic suppurative otitis media: a retrospective review. *EUR ARCH OTO RHINO L* 270:69-76, 2013
21. Zhang C, Hu L, Wu X, Hu G, Ding X, Lu Y. A retrospective study on the aetiology, management, and outcome of brain abscess in an 11-year, single-centre study from China. *BMC infectious diseases* 14:311, 2014