



Brain abscess Analysis of pathophysiology and clinical spectrum.

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ABSTRACT

Introduction : Brain abscess is defined as a focal, intra cerebral infection that begins as a localized area of cerebritis and develops into a collection of pus surrounded by a well-vascularized capsule. Although rare in developed countries brain abscess still remains a significant health care problem in developing countries . A breach in any of the barriers of the Brain like thick skull vault, tough duramater, and important barriers like bloodbrain barrier and blood csf barrier. leads to entry of microorganisms into the brain initiating a suppurative inflammation culminating in brain abscess. The inciting organism can be introduced from outside by trauma or endogenously from infection in a contiguous site eg.ear or occasionally bloodborne. Although the portal of entry of the organism is commonly identified ,the organism remains obscure in 10 -37% of the patients. In the recent decades the addition of CT and MRI to the diagnostic armamentarium has facilitated early identification and thereby prompt institution of therapy in brain abscess .Improved microbiological techniques and advanced surgical techniques viz.stereotactic guided aspiration, real-time ultrasound imaging have caused a paradigm shift in the management and outcome of brain abscess. Despite these advancements brain abscess remains a serious infection with a mortality rate of 5-15% which escalates to as high as 80% in case of rupture. In this study we aim to observe and analyse the clinical profile, radiological features, management and outcome of patients admitted in our institute with brain abscess over a period of three years.

Materials and methods: All patients admitted in the Institute of Neurology, Rajiv Gandhi Government General Hospital & Madras Medical College, Chennai, between august 2010 and December 2012, with brain abscess were included in this study. On admission patients clinical profile such as age, sex, admission GCS, presenting symptoms and signs were recorded. All patients were subjected to CT scan brain plain study. In patients having brain abscess the following features were noted – location, number of abscess, loculation, associated hydrocephalus. Patients were either managed conservatively or by surgery. Outcome analysis was done at the time of discharge.

Results- The overall results of this study in a total of 60 patients was a higher male to female ratio with significant pediatric involvement which showed higher mortality and morbidity compared to adult cohorts and a predominant parietal lobe involvement with the majority of abscesses showing being solitary and with no bacteriological growth with staphylococcus being the commonest organism. Commonest symptoms were fever, headache and vomiting, CSOM was the most common inciting cause and patients with sepsis had 100% mortality.

KEYWORDS : Brain abscess, bacteriology, CSOM, Staphylococcus, CT imaging, antibiotics, craniotomy and tapping..

INTRODUCTION

Brain abscess is defined as a focal, intra cerebral infection that begins as a localized area of cerebritis and develops into a collection of pus surrounded by a well-vascularized capsule. Although rare in developed countries brain abscess still remains a significant health care problem in developing countries .Historically brain abscess was mentioned by Hippocrates in 460 BC and he himself has described the association of brain abscess with ear infection. The brain is well protected from infections by a thick skull vault ,tough duramater ,and important barriers like bloodbrain barrier and blood csf barrier.A breach in any of these barriers leads to entry of microorganisms into the brain initiating a suppurative inflammation culminating in brain abscess.The inciting organism can be introduced from outside by trauma or endogenously from infection in a contiguous site eg.ear or occasionally bloodborne. Although the portal of entry of the organism is commonly identified ,the organism remains obscure in 10 -37% of the patients.

In the recent decades the addition of CT and MRI to the diagnostic armamentarium has facilitated early identification and thereby prompt institution of therapy in brain abscess .Improved microbiological techniques have increased the appreciation of the bacteriological spectrum of brain abscess especially anerobes.The advanced surgical techniques viz.stereotactic guided aspiration , real-time ultrasound imaging have caused a paradigm shift in the management and outcome of brain abscess.Despite these advancements brain abscess remains a serious infection with a mortality rate of 5-15% which escalates to as high as 80% in case of rupture. In this study we aim to observe and analyse the clinical profile, radiological features, management and outcome of patients admitted in our institute with brain abscess over a period of three years.

AIM OF THE STUDY

Aim of the study is to analyze the patients with brain abscess with respect to age, sex, immune status, lobar preference, radiology, microbiological profile, identify the predisposing factors that cause brain abscess and evaluate about the intervention which is needed and further to analyze the final outcome of patients with brain abscess and

to enable the neurologists and neurosurgeons to understand and correlate the varied clinical manifestations.

MATERIALS AND METHODS

All patients admitted in the Institute of Neurology, Rajiv Gandhi Government General Hospital & Madras Medical College, Chennai, between august 2010 and december 2012, with brain abscess were included in this study.

Inclusion criteria-All patients who have been diagnosed as having brain abscess were included in the study group.

Exclusion criteria-None

On admission patients clinical profile such as age, sex, admission GCS, presenting symptoms and signs were recorded. All patients were subjected to CT scan brain plain study. In patients having brain abscess the following features were noted – location, number of abscess, loculation, associated hydrocephalus. Patients were either managed conservatively or by surgery. The information collected regarding all the selected cases were recorded in a Master Chart and data analysis was done.

DISCUSSION

We have seen 60 cases in the 3 year study period, on an average of 20 cases per year and this study clearly reveals that brain abscess remains a significant neurosurgical problem even in this era of broad spectrum antimicrobial therapy

Age-It is well noticed that brain abscess occurs in any age. There is no age predilection and people of all age group are affected. Most commonly patients belong to the age group of years. Majority of cases occur between second and third decades of age. According to McClelland et al middle decade of life is common to this , where as in Sinha et al, patients below 20yearsof age accounts for 74-89% of patients. Though rare in neonates and infants ,there are documented reports of brain abscess in this age group is found.

Sex-When comparing the incidence of brain abscess ,males outnumber

the females at any age group. This predilection of male sex though unclear may be attributed to their occupation, Road traffic accident etc

Symptoms Though fever is an important symptom in the majority of cases, few cases do occur without fever. As any other intra cranial lesion which increases the intra cranial pressure and producing vomiting, brain abscess patients too have this symptom in majority of cases. The classical triad of fever, head ache, and neurological deficit is present in majority of cases in this study. The conscious level at the time of admission is a reliable prognostic marker. Majority of our cases > 80% is admitted with a GCS of >10. Cases with GCS <9 have a high mortality rate, which is reported in many series. This is well appreciated in this study also. Among the 60 patients, 54 had fever, 39 had headache, 35 had vomiting. Seizures were present in 21 patients, hemiparesis in 9 cases and cerebellar symptoms are present in 4 cases. The predisposing source causing brain abscess is present in 41 cases. CSOM is found to be the commonest source in 12 patients causing brain abscess. This is supported by a large series of studies from developing countries. These otogenic abscess are mainly solitary and located in either temporal lobe or in the cerebellum.

Heart Diseases Cyanotic congenital heart disease causing Brain abscess has been encountered in 5 cases. Brain abscess and Cerebral thrombosis are the serious complications due to CHD. If the CHD is not corrected the micro infarcts caused by them become a nidus for the micro organisms resulting in bacteremia causing abscess. Tetralogy of Fallot and transposition of great vessels are the major causes. In this study 3 are in the ages between 4-8 years, the other 2 are in 16-22 years.

RTA With the rise of road traffic accidents, industrialization terrorism etc incidence of head injury is increasing and more brain abscess occur. In this study 7 cases 12% are due to trauma.

Infections Lung infections like bronchiectasis, pneumonia pleural effusion is 2 cases. Post craniotomy patients causing abscess is seen in 3 patients. The entry of micro organisms may be gained during the surgery. In 4 patients septic foci like gluteal abscess, pyelonephritis, skin pustules and cellulitis Sinusitis is noted in 2 cases. Majority of the infants with brain abscess were found referred from paediatric ICU as neonatal sepsis. These infants are either pre term or small for gestation. These cases are more prone for infection, though the sources remain obscure.

Location In this study solitary lesions are more common, but multiple lesions occurring simultaneously have also been reported. Hematogenous spread from distant source of infection cause Multiple abscess. In multiple lesions each lesion is separated by a normal brain parenchyma. In multiloculated abscess no Such normal parenchyma is between the lesions. Solitary lesions are present in 38 cases in our study. The frontal lobe is involved in 8 cases, temporal lobe 7 cases, parietal lobe 12 cases, occipital lobe 2 cases, and eloquent areas in 3 cases. In the cerebellum 6 patients have solitary lesions. Multiple lesions present in 22 cases in which the left hemisphere is involved in 9 patients, right hemisphere in 5 cases and both hemispheres in 9 patients.

The eloquent areas like thalamus, ganglio capsular region are involved in 3 cases. Among these cases multiloculated abscess are present in 9 patients. Symptoms of head ache, fever and vomiting constitute an Important triad in this study, which is present in > 60% of patients.

Depending on the predisposing factors certain lobes are more prone for brain abscess. In this study temporal lobe (4) and cerebellum (3) are more commonly involved in otogenic brain abscess. Parietal lobe was involved in a single patient. In two cases of frontal lobe abscess frontal sinusitis is the predisposing factor.

Microbiology The pus aspirated from the abscess Was subjected to microbiological examination like gram staining, Acid fast staining and fungal staining. This helps in the Identification of micro organisms and by doing culture and sensitivity appropriate anti microbial therapy was initiated. The role of microbiologist is more vital for the tuberculous and fungal abscess, because distinguishing these by clinical and radiological methods is very difficult. Culture was positive in cases and pus specimens yielded a single isolate. In the literature 44-100% of culture positivity was reported by De Louvois et al 1977, Chandramukhi et al 1980, Sinha et al 2003, Lakshmi et al 1993, De et al

2000.

Aerobes are more common than anaerobes in this study. Similar results are reported in large series, but reports of anaerobes dominating aerobes are also present (Bhardwaj & John et al 1985). In this study Streptococci, Staphylococci, are more common. Klebsiella, Pseudomonas, and anaerobes like Enterococci, bacteroides are also found. Fungal growth is Present in two cases. Majority of the specimens do not have Any growth. This may be attributed to the prior empirical, Broad spectrum anti microbial therapy, the fastidious growth

Requirements of the organisms, or a non bacterial origin of the abscess. No organism was isolated in 9-63% of pus specimens as per Gregory et al 1967 series. In our study the organisms are highly sensitive to third or fourth generation cephalosporins, and vancomycin. The anaerobes are sensitive to metronidazole. The fungal growth is sensitive to amphotericin-B, and Itraconazole.

Management The surgical procedures followed in this study are burr hole tapping, craniotomy and excision, stereotactic aspiration, external ventricular drainage and ventriculo-peritoneal shunt. In Some patients combination of procedures has also been done. For example in multiloculated and organized abscess repeated Aspiration is followed by craniotomy is done. Here 28 cases undergone Burr hole tapping in which 13 cases were retapped. Craniotomy and excision was done in 12 cases. Both craniotomy and excision was done in 4 cases. Stereotactic aspiration was done in a single patient where the abscess was deep seated in the ganglio capsular region. In three cases where the abscess and the surrounding edema caused CSF outflow obstruction two cases under went v-p shunt and in the other neonate external ventricular drainage was done. The excised abscess are histo pathologically examined and found to be non specific abscess.

Prognosis Among 60 cases, 53 patients improved and only seven patients expired. The age group ranges from 1 month to 30 years, four paediatric and three adult patients. In the paediatric cases two were neonates, referred from neonatal ICU, one with pyocephalus with bulging fontanelle in a drowsy and lethargic condition. External ventricular drainage was done, but the child expired. The other neonate with multiple abscess was repeatedly tapped. The pus contains staphylococci and, klebsiella, sensitive to Amikacin, cefotaxime and co-trimoxazole. The child has abscess in the face which could be the source of infection. The child condition deteriorated and expired. The other two paediatric cases were 3 and 7 years of age. The 3 year old female child with right hemiparesis CT showing left frontal and parietal abscess was admitted with a GCS 8. Burr hole tapping was done and about 30 cc of pus was aspirated. The child was treated with vancomycin. The condition of the child worsened and died. The 7 year old male child was retro viral positive. He presented with altered sensorium, left hemiparesis and papilledema CT showing right parietal abscess. Right parietal burr hole and tapping done. No growth was found. The child did not improve and expired. The three adult patients expired were 16, 27 and 30 years of age. The 16 year old had TOF and CSOM, The 30 year old developed abscess due to post traumatic sequela. In common all these seven cases had altered sensorium as a common factor during admission.

RESULTS

The overall results of this study in a total of 60 patients was a higher male to female ratio with significant pediatric involvement which showed higher mortality and morbidity compared to adult cohorts and a predominant parietal lobe involvement with the majority of abscesses showing being solitary and with no bacteriological growth with staphylococcus being the commonest organism. Commonest symptoms were fever, headache and vomiting, CSOM was the most common inciting cause and patients with sepsis had 100% mortality.

1. Total number of patients : 60
2. Total number of males : 44
3. Total number of females : 16
4. pediatric - 21
5. parietal lobe - 21%, frontal 14%, temporal 8% cerebellum 11%
6. Bacteriology - 35 patients no growth In the rest 25, 3 were AFB, 2 were fungal.
7. Staphylococcus commonest organism among 5 out of 25 positive cultures.
8. Common in age group less than 30 among which more frequently seen in infants.
9. Highest mortality was seen in pediatric age group 20%

10. patients presenting with sepsis 6 cases at admission had 100% mortality
11. symptoms- fever 87%, headache 63% and vomiting 60%
12. csom – 9 cases ,CHD -5 cases ,trauma 6 cases
13. solitary 43 cases and multiple -17 cases
14. Survival rate was better in patients in adult patients 92% when compared to pediatric patients 80%

CONCLUSION

A study of 60 patients presenting with brain abscess has lead to the following conclusions.

1. CT Brain helps in the early diagnosis of brain abscess and thereby better management and outcome.
2. Brain abscess was common in male sex.
3. Parietal location the commonest.
4. In more than 50% with no organism in the culture abscess
5. Patients presented with sepsis and altered sensorium had poor prognosis irrespective of other factors.

OBSERVATIONS AND TABLES

TABLE 1 - Age Predilection

AGE	Number of Patients
Less than 1 year	13
1 to 12 years	8
13 to 20 years	12
21 to 30 years	11
31 to 40 years	8
41 to 50 years	3
51 to 60 years	3
61 to 70 years	2
Total	60

TABLE 2 AGE WISE SEX DISTRIBUTION

AGE	FEMALE	MALE	Total
Less than 1 year	7	6	13
1 to 12 years	2	6	8
13 to 20 years	3	9	12
21 to 30 years	3	8	11
31 to 40 years	1	7	8
41 to 50 years	0	3	3
51 to 60 years	0	3	3
61 to 70 years	0	2	2
Total	16	44	60

TABLE 3 SYMPTOMS

SYMPTOM	PRESENT	ABSENT
FEVER	52	8
HEADACHE	38	22
SEIZURES	24	36
VOMITING	36	24

TABLE 4- ETIOLOGY

TRAUMA	
NO HISTORY OF TRAUMA	54
HISTORY OF TRAUMA	6
TOTAL	60
CONGENITAL HEART DISEASE	
NONE	55
TGAVSD	1
TOF	3
TOF + PULMONARY ATRESIA	1
TOTAL	60
ENT	
FRONTAL SINUSITIS	1
LEFT CSOM	6
RIGHT CSOM	3
NONE	50
TOTAL	60
LUNG	
BRONCHIECTASIS	1
NONE	57

PNEUMONIA	1
PNEUMONIA-SLE	1
TOTAL	60
OTHER ASSOCIATED DISEASES	
HIV	2
NONE	51
ORBITAL CELLULITIS	1
PRE TERM / SEPSIS	4
SEPSIS	1
THIGH ABSCESS ,CGD	1
TOTAL	60

TABLE 5 PREDISPOSING CAUSES

Predisposing Cause	Number of Patients Affected
FRONTAL SINUSITIS	1
LEFT CSOM	6
RIGHT CSOM	3
TGAVSD	1
TOF	3
TOF + PULMONARY ATRESIA	1
BRONCHIECTASIS	1
PNEUMONIA	1
PNEUMONIA-SLE	1
HIV	2
ORBITAL CELLULITIS	1
Pre term / SEPSIS	4
SEPSIS	1
THIGH ABSCESS ,CGD	1
None	33
Total	60

TABLE 6 CLINICAL FINDINGS

FOCAL NEUROLOGICAL DEFICITS	Frequency
L HEMIPARESIS	6
R HEMIPARESIS	5
NONE	49
Total	60
OTHERS	
ALTERED LEVEL OF CONSCIOUSNESS	13
ATAXIA	4
HAEMORRHAGIC DISORDER	1
JAUNDICE	1
NONE	41
Total	60

TABLE 7 SIDE OF LESIONS

Side of Lesions	Number of Patients
BIFRONTAL	2
LEFT	29
MULTIPLE	6
RIGHT	23
Total	60

TABLE 8 LOCATION OF LESIONS

Location of Lesions	Number of Patients
BIFRONTAL	2
CEREBELLUM	7
FRONTAL	10
FRONTOPARIETAL	2
GANGLIOCAPSULAR	2
MULTIPLE	6
OCCIPITAL	3
PARIETAL	13
PARIETOOCCIPITAL	2
TEMPEROOCCIPITAL	1
TEMPEROPARIETAL	4
TEMPORAL	8
Total	60

TABLE 9 MANAGEMENT

MANAGEMENT	Number of Patients
AF TAPPING	1
BURR HOLE AND TAPPING	34

BURR HOLE AND TAPPING + CRANIOTOMY AND EXCISION	2
BURR HOLE AND TAPPING + VP SHUNT RIGHT	1
CONSERVATIVE	8
CRANIOTOMY AND EXCISION	11
EVD RIGHT FRONTAL	1
STEREOTAXY	1
VP SHUNT RIGHT	1
Total	60

TABLE 10 MICROBIOLOGICAL PROFILE

MICROBIOLOGY	Number of Patients
AFB	2
AFB + Staph	1
BACTEROIDS	1
ENTEROCOCCI,CANDIDA	1
KLEBSIELLA	3
KLEBSIELLA ,STAPH	1
NO GROWTH	43
NOCARDIA	1
PSEUDOMONAS	1
STAPHYLOCOCCUS AUREUS	4
COAGULASE NEGATIVE STAPHYLOCOCCUS	1
STREPTOCOCCUS	1
Total	60

TABLE 11 HPE

HPE	Frequency
NON SPECIFIC ABSCESS	13
NOT APPLICABLE	47
Total	60

TABLE 12 ANTIBIOTIC SENSITIVITY

ANTIBIOTICS	Number of Patients
AMPHOTERICIN B	1
ATT	4
ATT + CP, GM, METRO	1
CIPRO	3
CIPRO / AMIK	1
CIPRO + AMPHOTERICIN B	1
CIPRO / OFLOX	1
CO-TR	3
CO-TRIMAX / AMIKACIN	1
EMPIRICAL CP, GM, METRO	42
ERYTHRO	1
VANCOMY / CIPRO	1
Total	60

TABLE 13 OUTCOME

OUTCOME	NUMBER OF PATIENTS
ABSCONDED	2
AMA	1
DIED	7
IMPROVED	50
Total	60

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