

## Brain abscess: a clinical experience in a tertiary care hospital

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### Abstract:

**Background:** A brain abscess is a focal, intracerebral infection that begins as a localized area of cerebritis and develops in to collection of pus surrounded by capsule. It is still a very important pathology with high morbidity and mortality. The objective of this study is to determine etiology, nature, clinical features, and outcome of brain abscess.

**Material and Methods:** This is a descriptive study on 48 patients with brain abscess in the Department of Neuro-surgery, Pakistan Institute of Medical Sciences from February 2010 to July 2011. All patients admitted with brain abscess were included in the study. Patients age, gender, source of abscess, type of abscess, location of abscess clinical manifestation, type of surgical procedure were documented on pre designed Performa. Outcome was measured on Glasgow outcome scale. Data analyzed using SPSS version 20.0 and presented in form of tables.

**Results:** Out of 48 patients 28(58.3%) were male and 20(41.6%) were female with male to female ratio=1.5/1. Age distribution was 8 to 60 years with mean age was 34.25 + 2.54 years. The most common neurological sign and symptoms observed in our study were headache 38(79.1%), nausea and vomiting in 15(31.2%), altered state of consciousness in 7(14.5%) and fever in 25(52.0%) patients. 40(83.3%) patients underwent surgical procedures. Single burr hole aspiration done in 31(64.5%) and craniotomy and excision of abscess in 9(18.75%) of patients. In our study a total of 38(79.1%) had good outcome which include 18(37.5%) in good recovery and 20(41.6%) had moderate disability.

**Conclusion:** Brain abscess is common in middle age group with male predominance. Early diagnosis, timely surgical intervention and use of proper antibiotics are essential for good outcome.

**Keywords:** Brain abscess, altered state of consciousness, Etiology, Burrhole aspiration, Outcome, craniotomy.

### Introduction:

Brain abscess is a focal suppurative infection of the brain parenchyma which occurs as a result contiguous infection, penetrating head injury, hematogenous spread from extracranial source or neurosurgical procedures.<sup>1-7</sup> Despite advancement in imaging techniques and antibiotic therapy brain abscess is still a very important intracranial lesion with high morbidity and mortality.<sup>8</sup> The prevalence of brain abscess in developed countries is 0.9 per 100,000 persons-years, however this incidence is quiet high in developing countries due to poor hygienic conditions and nutritional status.<sup>6,9</sup>

The most common pathogen isolated were streptococci viridians, staphylococcus aureus, aerobes and gram negative bacilli.<sup>10</sup> Patients usually present with symptoms of raised intracranial pressure (headache, nausea, vomiting), hemiparesis, seizure, mental status changes and fever. In new born patient presented with meningitis, seizure, irritability, increase head circumference and failure to thrive. The location of abscess determines the focal neurological sign such as paresis, visual deterioration, cranial nerve palsies, nystagmus, cerebellar ataxia and papilledema.<sup>11-13</sup>

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Computerized tomography (CT) and Magnetic resonance imaging (MRI) were used for the diagnosis and management of patient with brain abscess.<sup>14,15</sup> There is no single best method for treating a brain abscess, however combination of surgical and medical treatment has dramatically reduces neurological deficit and decrease mortality rate from 40-60% to 0-10%.<sup>16,17</sup> Patients having lesion with significant mass effect on CT/MRI, lesion located in proximity to ventricle, multiloculated abscess, traumatic abscess associated with foreign material and poor neurological condition are candidates for surgical intervention.<sup>18</sup> The surgery include single burr hole aspiration and craniotomy with excision of abscess.<sup>19</sup> Medical treatment alone was considered in poor surgical candidates and in multiple and small abscess or in eloquent areas like motor cortex or brain stem. Antimicrobial therapy includes intravenous antibiotics for 6-8 weeks followed by oral route 4-8 weeks.<sup>19,20</sup> The use of corticosteroids and antiepileptics are controversial and a subject of debate.<sup>21</sup>

The objective of this study was to analyze etiology, risk factor, clinical manifestation and outcome of patients presenting with brain abscess. The results of this study will give us an insight into the evolution of patient and will allow us to establish optimal management of these lesions.

#### **Material and Methods:**

This cross-sectional descriptive study was conducted in department of Neurosurgery, Pakistan Institute of Medical Sciences Islamabad from February 2010 to July 2011. Total 48 patients admitted via outpatient department, Emergency department or referred from other departments and hospital were included in the study. All patients presented with brain abscess were included in study, while patient with tubercular meningitis, Glioblastoma multiforme, tuberculoma, subdural empyema and extra dural abscess were excluded.

Approval from hospital ethical committee was obtained. Written informed consent was taken from patients. After admission, detailed history and clinical examination was performed.

Findings of each patients including sex, age distribution, location of lesion, clinical characteristic, predisposing factor, pathological organism prognosis and surgical outcome was documented. Computed tomography (CT) and Magnetic resonance imaging (MRI) were used for evaluation and diagnosis done in all patients. Investigation like white blood cell count (WBC) and erythrocyte sedimentation rate (ESR) were done. Ear, Nose, throat (ENT) and cardiology consultation was sometimes required to identify the primary source of infection.

Patients having lesion with significant mass effect on CT/MRI, lesion located in proximity to ventricles, Multi loculated abscess, traumatic abscess associated with foreign material and poor neurological condition were operated via Burr-hole aspiration and craniotomy with excision of abscess. Pus obtained from abscess was cultured for aerobic and anaerobic bacteria. Intravenous antibiotic for 6 to 8 weeks was administered followed by oral route for 4-6 weeks. Corticosteroids and antiepileptic given in selected patients. Small and multiple abscesses in eloquent area were managed conservatively; however, CT scan performed every two weeks for evaluation of lesion and if condition deteriorated surgery was considered. After complete course of antibiotics, CT repeated for 3 months until complete resolution of abscess.

Outcome was measured based on Glasgow outcome scale (GOS) at one month. Data was analyzed using SPSS version 20.0 and presented in form of tables.

#### **Results:**

A total 48 patients were recruited in this study. Out of which 28(58.3%) were male and 20(41.6%) were female with male to female ratio=1.5/1. Age distribution was 8 to 60 years with mean age was 34.25+2.54 years.

In our study the primary source of infection was identified in 35(72.9%) while in 13(27%) patients the etiology is not known. The most common cause of brain abscess in our population was contiguous spread 14(29.1%), among

Table-1: Source of brain Abscess. (n=48)

Source of brain abscess	Frequency	Patients
<b>Contiguous spread</b>	14	29%
a) Mastoid air sinus infection/ middle ear	9	18.75%
b) Paranasal sinusitis	5	10.41%
<b>Hematogenous spread</b>	13	27%
a) Cyanotic heart disease	4	8.3%
b) Bacterial endocarditis	3	6.25%
c) Lung abscess	3	6.25%
d) Dental abscess	3	6.25%
<b>Post-Neurosurgical procedure</b>	5	10.41%
<b>Penetrating cranial trauma</b>	3	6.25%
<b>Unknown</b>	13	27%

Table-2: Clinical features (n=48)

Signs and symptoms	Frequency	Percentages
Headache	38	79%
Nausea and vomiting	15	31%
Fever	25	52%
Altered level of consciousness	7	14.5%
Neurological deficit	18	37.5%
Seizure	10	20.8%
Papilloedema	11	23%
Sign of meningism	6	12.5%

\*Sum may not be 100% as each patient presented with more than one clinical feature

Table-3: Location of Abscess (n=48)

Site	Frequency	Percentages
<b>Solitary</b>	36	75%
a. Frontal lobe	11	23%
b. Temporal lobe	08	16.6%
c. Parietal lobe	07	14.5%
d. Occipital lobe	03	6.25%
e. Basal ganglia and thalamus	02	4%
f. Cerebellum	05	10.4%
<b>Multiple abscess</b>	12	25

Table-4: Glasgow outcome scale (n=48)

Scale	Meaning	Frequency	Percentage
5	Good recovery	18	37.5%
4	Moderate disability	20	41.6%
3	Severe disability	4	8.3%
2	Persistent vegetative state	1	2.0%
1	Death	5	10.4%

these 9(18.75%) had mastoid air sinus/middle ear infection and 5(10.4%) had paranasal sinusitis. Second most common etiology in our study was hematogenous spread 13(27.08%); 4 (8.3%) patients had cyanotic heart disease while 3(6.25%) patients present with bacterial endocarditis, lung abscess and dental abscess each. 5(10.4%) brain abscesses were due to post neu-

rosurgical procedure and 3(6.25%) had brain abscess due to penetrating cranial trauma, as shown in table. No. I

Pre-disposing factors for developing a typical infection were observed in 11(22.9%) cases. 5(10.4%) had underlying Diabetes mellitus, 4(8.3%) were immune compromised, 3(6.25%) with hematological disease and 4 (8.3%) had cardiac co morbid conditions.

The most common neurological sign and symptoms observed in our study were headache 38(79.1%), nausea and vomiting in 15(31.2%), altered state of consciousness in 7(14.5%) and fever in 25(52.0%) patients. Papilloedema was noted in 11(22.9%) cases, seizure occurred in 10(20.8%) cases and focal neurological deficit was present in 18(37.5%). Mean duration of symptoms before diagnosis was 30 days (range 3-60 days) patients as shown in table. No. II

In our study CT Scan done in all patients while MRI was only performed in 30(62.5%) cases. Regarding the location of abscess 36(75%) were solitary and 12(25%) were multiple abscess. In case of multiple abscesses the number of lesions varied between 2 to 5. The most common location for solitary abscess was frontal lobe 11(22.9%), followed by temporal lobe 8(16.6%), parietal 7(14.5%) and occipital 3(6.25%). 2(4.1%) abscesses in basal ganglia and thalamus and 5(10.4%) in cerebellum. Sinogenic abscesses were located in frontal lobe while otogenic abscess in temporal lobe and occipital lobe, as shown in table. No. III.

In the management of abscess all patients were treated with triple regimen antibiotics which include third generation cephalosporin, metronidazole and gentamycin. Conservative treatment alone was given in 8(16.6%) patients i.e. 6(12.5%) with multiple small abscesses and 2(4.1%) abscesses in eloquent area i.e basal ganglia and thalamus. Corticosteroid used in selected patients to reduce the edema while anti-convulsant was used in majority of patient.

40(83.3%) patients underwent surgical pro-

cedures. Single burr hole aspiration was done in 31(64.5%) and craniotomy and excision of abscess in 9(18.75%) of patients. Burr hole aspiration was preferred over craniotomy as its an emergency procedure and can easily be performed by neurosurgery resident. Repeated aspiration was done in 6(12.5%). Craniotomy and excision of abscess was done in multiloculated abscess 4(8.3%), post traumatic abscess 3(6.25%) and abscess located in posterior fossa 2(4.1%).

The clinical outcome was measured at the end of month by using Glasgow outcome scale as shown in table. No. IV. Good outcome was defined as good recovery and moderate disability. Poor outcome was defined as severe disability, persistent vegetative state and death. In our study a total of 38(79.1%) had good outcome which included 18(37.5%) in good recovery and 20(41.6%) had moderate disability. Poor outcome observed in 10(20.8%): 4(8.3%) had severe disability, 1(2.0%) in persistent vegetative state and 5(10.4%) expired due to pulmonary insufficiency and cardiac arrest.

#### Discussion:

With the advent of modern neuro-imaging technique and antibiotics the diagnosis and treatment of brain abscess has improved significantly. In various study the mortality had declined from 40-60% in pre CT era to 0-10% recently.<sup>16,17</sup>

In our study male were predominant than female with male to female ratio was 1.5:1 and majority of patient were in age range of first four decade of life with mean age was 34.25 years. Gadgil N et al studied 100 cases and conclude male to female ratio 2:1 while mean age of presentation was 38 years<sup>22</sup> which resembles our study.

In our study the most frequent sign and symptoms were headache 38(79.1%), vomiting 15(39.2%), fever 25(52%), focal neurological deficit(18(37.5%)), altered mental consciousness 7(14.5%), papilloedema 11(22.9%), seizure 10(20.8%) and sign of meningeal irritation 6(12.5%). Almost compatible results obtained with number of other studies.<sup>23,24</sup>

The most common source of brain abscess is contiguous spread either from mastoid ear cell or para nasal sinusitis 14(29.1%), followed by hematogenous spread 13(27%), post neuro-surgical procedure 5(10.4%) and penetrating cranial trauma 3(6.25%). Saral et al. in Mumbai India recruited 75 patients with brain abscess and concluded 49.3% of patients had otogenic source, followed by 29.3% had cryptogenic source while 8% of patients had cyanotic heart disease (CHD).<sup>25</sup> The results slightly high as compared to our study.

In our study, regarding the location of abscess 36(75%) were solitary and 12(25%) were multiple abscesses. In case of multiple abscesses the number of lesion varied between 2 to 5. The most common location for solitary abscess was frontal lobe 11(22.9%), followed by temporal lobe 8(16.6%), parietal 7(14.5%) and occipital 3(6.25%). Almost same result were obtained by study done in Turkey.<sup>26</sup>

In our study conservative treatment alone was given in 8(16.6%) subjects. 40(83.3%) patients underwent surgical procedures, out of which Single burrhole aspiration was done in 31(64.5%) and craniotomy and excision of abscess in 9(18.75%) of patients. Auvichayapat et al.<sup>27</sup> and Goodkin et al.<sup>28</sup> treated 14.7% and 12.5% of their cases, respectively, with medical therapy alone which resembles our study. Yasemin Ozurekci et al.<sup>26</sup> studied 75 cases of brain abscess; 57(76%) underwent surgical procedure which include aspiration in 30(40%) and excision in 27(36%).

The most important factor for prognosis and outcome of brain abscess depends upon Glasgow coma score ( GCS) at the time of presentation. Therefore patient presented with GCS 15/15 had good outcome and vice versa<sup>24</sup>. In the last decade most of the studies published document high morbidity and mortality in patient with brain abscess. Bidzinski and Koszweski's<sup>19</sup> in 2002 reported 63% of patient had good recovery, 23% had moderate disability 9% had severe disability and 5% mortality rate. Xiao et al.<sup>9</sup> Concluded 62% with good outcome, 8% had se-

vere disability, 5% in persistent vegetative state and 25% died. In our series 38(79.1%) had good outcome, which include 18(37.5%) had good recovery and 20(41.6%) had moderate disability. Poor outcome observed in 10(20.8%): 4(8.3%) had sever disability, 1(2.0%) in persistent vegetative state and 5(10.4%) died.

### Conclusion:

Brain abscess is common in middle age group with male predominance. Although it can be successfully treated with antibiotics alone in selected cases, however surgery still remains the main treatment modality and burrhole is preferred over craniotomy and excision of abscess. Early diagnosis, timely surgical intervention and use of proper antibiotics are essential for good outcome.

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### Role and contribution of authors:

Dr Sohail Amir conceived the idea, and wrote the introduction, result, discussion and conclusion, critically revised and submitted for publication

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