

# Outcome of Intracerebral Abscesses by Burr Hole and Aspiration

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## Abstract

**Background:** Intracerebral abscesses are still a very important pathology, with high mortality and morbidity, even with the advancement of imaging technologies and antibiotic treatment. Though rare in developed world, there remains a diagnostic and therapeutic challenge in the developing countries like Bangladesh. This study was aimed to treat the cases of intracerebral abscesses by burr hole and aspiration which is relatively safe and can be performed in an emergency situation and to prove its effectiveness in a developing country like Bangladesh.

**Methods:** This is a Quasi-Experimental study. This study was carried out in the Department of Neurosurgery, DMCH from July' 2014 to June' 2016. Sampling method was purposive and sample size was 30. Study population was selected as per inclusion and exclusion criteria. Data were collected in preformed data sheet and analysis was done by SPSS Ver-21.

**Results:** Out of total 30 cases all were treated by burr hole and aspiration. Among them multiple aspirations were needed in 4 cases due to incomplete aspiration and out of these 4 cases 2 cases needed craniotomy and excision for total excision. A male predominance was observed. Initial GCS had significant effect on outcome. Post-operative CT scan shows reduction of the sizes of the abscesses and was statistically significant ( $p < 0.05$ ). Upon 3 months follow up, 23 patients showed good outcome based on GOS.

**Conclusion:** Burr hole and aspiration remains safe and effective as the primary surgical intervention of intracerebral abscesses. The procedure can be performed in emergency situations on patients of any age even under local anaesthesia.

**Key Words:** Intracerebral Abscesses, Burr Hole, Aspiration.

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## Introduction:

Brain abscess is an abscess caused by inflammation and collection of infected material, coming from local (ear infection, dental abscess, infection of paranasal sinuses, infection of the mastoid air cells, epidural abscess) or remote (lung, heart etc.) infectious sources, within the brain tissue. The infection may also be introduced through a skull fracture following a head trauma or a neurosurgical procedure. It begins

with an area of inflammation, known as cerebritis, and later develops into a collection of necrotic pus surrounded by a vascular capsule. In developed countries, brain abscess is now a rare entity in the general population, with incidence rate of 0.3-1.3 cases per 100,000 per year<sup>1</sup>. It accounts for less than 1% of intracranial lesions in the developed world, as opposed to roughly 8% in developing countries<sup>2,3</sup>. Although brain abscess can affect both sexes, in multiple series of both pediatric and adult patients, the male-to-female ratio of brain abscess has been demonstrated to range from 2:1 to as great as 4:1<sup>4,5</sup>. Overall, about 25% of cases of brain abscesses still occur in children, typically among those aged 4-7 years<sup>6</sup>. In pediatric series, congenital heart disease remains the most common predisposing factor<sup>7</sup>.

Two primary treatments are used to manage brain abscesses: burr hole and aspiration with or without image guidance, and open craniotomy with excision. Burr hole aspiration is the therapy of choice over open craniotomy excision<sup>8,9</sup>, because it is less invasive, thus reducing the likelihood of neurological

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sequelae. In most modern series, the mortality rate is typically less than 15%<sup>10</sup>. Rupture of a brain abscess infrequently occurs and is associated with a high mortality rate (up to 80%)<sup>11</sup>. Significant morbidity, including seizures, persistent weakness, aphasia, or cognitive impairment, affects an estimated at 20-30% of survivors. Favorable outcomes have been associated with a number of factors, including initial GCS score of higher than 12, absence of underlying disease, or sepsis<sup>12</sup>.

Judicious use of intravenous antibiotics for 6-8 weeks is an important part of successful treatment. Some studies shows that, despite 6-8 weeks of antibiotic treatment, the recurrence was reported to be 5-10% after stopping antibiotic<sup>13</sup>. This study was carried out with an aim to determine the safety and effectiveness of burr hole and aspiration of intracerebral abscesses by Glasgow outcome scale and by the size of the abscesses in the post-operative CT scan.

#### Materials and Methods:

This was a Quasi experimental study. A total of 30 patients of both sex and any age with intracerebral abscess that underwent burr hole and aspiration in the Department of Neurosurgery, Dhaka Medical College and Hospital (DMCH), during the period of July 2014 to June 2016, were included in this study. Patients with intracerebral abscess diagnosed clinically and by CT scan of brain and those who gave consent were enrolled in his study. Pregnant women, evidence of neurological symptoms unrelated to brain abscess, not underwent a drainage procedure or intraoperative pus sampling, or patient lost to follow-up during the study period and patient who didn't gave consent were excluded from the study. The present study findings were discussed and compared with previously published relevant studies. Appropriate data were collected using a preformed data sheet. All other necessary data were collected from history sheet and investigation papers. Data were processed and analyzed using SPSS (statistical Package for Social Science) software. Test statistics were used to analyze the data were Chi-square test. Data process on categorical scale was present as frequency and percentage. While data presented on continuous scale, it was presented as mean + SD (standard deviation) and analyze with the help of unpaired 't' test, paired 't' test. The level of significance was 5%. P value < 0.05 was considered to be significant. The summarize data were present in the table and chart.

## Results

**Table-I**  
*Distribution of the study patients by demographic variable (n=30)*

Demographic variable	Number of patients	Percentage
Age (in years)		
≤10	14	46.7
11-20	5	16.7
21-30	5	16.7
31-40	1	3.3
41-50	1	3.3
51-60	4	13.3
Mean±SD	20.3±19.0	
Range (min, max)	2,60	
Sex		
Male	19	63.3
Female	11	36.7

Table I shows demographic variables of the study patients. A total 30 patients were included in this study. It was observed that almost half (46.7%) patients were belonged to age d"10 years. The mean age was found 20.3±19.0 years with range from 2 to 60 years. Almost two third (63.3%) patients were male and 11(36.7) were female. Male female ratio was 1.7:1.

**Table-II**  
*Distribution of the study patients by Glasgow coma score on admission (n=30)*

GCS on admission	Number of patients	Percentage
14-15	25	83.3
<13	5	16.7

Table II shows the GCS score at presentation. Most of the patients presented with good GCS score, (i.e. 15-14) numbering 25 (83.3%) and a GCS score < 13 is found only in 5 patients (16.7%).

**Table-III**  
*Distribution of the study patients by mode of operation (n=30)*

Mode of operation	Number of patients	Percentage
Burr hole and aspiration	30	100.0
Multiple aspirations	4	13.3
Craniotomy and excision	2	6.7

Table III shows mode of operation of the study patients, it was observed that all (100.0%) patients undergone burr hole and aspiration followed by 4(13.3%) with multiple aspirations and in 2(6.7%) craniotomy and excision were performed.

**Table-IV**  
*Distribution of the study patients by Glasgow Outcome Scale (n=30)*

Glasgow Outcome Scale	Number of patients	Percentage
1	2	6.7
2-3	5	16.7
4-5	23	76.6

Table IV shows Glasgow outcome scale of the study patients, it was observed that more than three fourth (76.6%) patients were found in Glasgow outcome scale 4-5 followed by 2(6.7%) in scale 1 and 5(16.7%) were in Glasgow outcome scale 2-3.

**Table-V**  
*Distribution of the study patients by mortality and morbidity (n=30)*

Glasgow mortality/ morbidity	Number of patients	Percentage
Morbidity	4	13.0
Mortality	2	6.7

Table V shows mortality and morbidity of the study patients, it was observed that (13.0%) patients had morbidity and mortality was 2(6.7%).

**Table-VI**  
*Association between Glasgow outcome with GCS on admission (n=30)*

GCS on admission	Glasgow outcome				P value
	Poor		Good		
	outcome (n=7)		outcome (n=23)		
	n	%	n	%	
≤13	3	42.9	2	8.7	
14-15	4	57.1	21	91.3	
Mean±SD	13.0±2.45		14.39±1.12		0.041 <sup>s</sup>
Range (min, max)	8.15		10.15		

s= significant

P value reached from unpaired t-test

**Table-VII**  
*Association between Glasgow outcome with mode of operation (n=30)*

Mode of operation admission	Glasgow outcome				P value
	Poor		Good		
	outcome (n=7)		outcome (n=23)		
	n	%	n	%	
Burr hole and aspiration	5	71.4	21	91.3	0.175 <sup>ns</sup>
Burr hole and multiple aspiration	2	28.6	2	8.7	

ns= not significant

P value reached from chi square test

4(57.1%) patients were 14-15 GCS on admission in poor outcome group and 21(91.3%) in good outcome group. Mean GCS on admission was found 13.0±2.45 score in poor outcome group and 14.39±1.12 score in good outcome group. The difference was statistically significant ( $p < 0.05$ ) between two groups.

Almost three fourth (71.4%) patients undergone burr hole and aspiration in poor outcome and 21(91.3%) in good outcome group whereas multiple aspirations needed in 2(28.6) patients each both in poor and good outcome groups. The differences were not statistically significant ( $p > 0.05$ ) between two groups.

### Discussion:

In this study it was observed that almost half (46.7%) patients were belonged to age d"10 years and the mean age was a found 20.3±19.0 year with ranged from 2 to 60 years. Similarly age ranged also observed by Sarmast et al. where the authors found the youngest patient being 6 months old and oldest patient was 70 years of age<sup>14</sup>. In another study, it was found that the youngest patient included was 13 years old and the oldest was 65 years old with the mean age of the patients was 36.6 years old, which are closely resembled with the present study<sup>15</sup>. On the other hand Qasim et al. found the mean age was 12.6±9.70 years, which differ with the current study, which may be due to the enrolled children in this study population<sup>16</sup>. In this current study it was observed that male (63.3%) was more commonly affected than female 36.7%, at a ratio of 1.7:1. Similarly, Qasim et al. and Tan et al. found male to female ratio were 2:1 and 1.8:1 respectively<sup>15,16</sup>. Similar observations regarding the male predominant were also observed in other studies.

Glasgow coma scale (GCS) score at presentation was found significant determinant of outcome. In this

series it was observed that majority (83.3%) patients was found GCS on admission 14-15 and 5(16.7%) was d"13. Similarly, Qasim et al. found Glasgow coma scale 12-13 was 15.0% patients and 14-15 was 85.0% patients. In another study Sarmast et al. found 6.1% had a low score on GCS (<13) whereas majority (93.9%) of their study patients were alert at the time of admission with a GCS >13, which are consistent with the current study<sup>14,16</sup>.

In this series it was observed that majority (90.0%) patients were found with single abscess and 10.0% had multiple abscesses. Gorgan et al. found 92.85% cases presented with a single intracerebral abscess and 7.14% cases had multiple lesions<sup>17</sup>. In another study Sarmast et al. found 2.6% patients had abscesses at multiple places, which is comparable with the current study<sup>14</sup>. In this study it was observed that all patients of intracerebral abscesses were undergone a burr hole and aspiration of pus. Among them 4 (13.3%) patients underwent second burr hole aspiration due to residual abscess on post-op CT images. In 2 patients, second aspiration was satisfactory, but the other 2 patients needed craniotomy for total excision of abscess as those 2 patients showed no significant clinical improvement even after second aspiration followed by antibiotic therapy. Zhang et al. found 60.0% of the cases, the treatment of choice was stereotactically guided aspiration<sup>18</sup>, while 30.0% of the cases were managed through open craniotomy excision, which is comparable with the current study. Hakan et al. reported that 19% of their patients and Jannik Helweg-Larsen et al, reported 33% of their patients needed aspiration more than once<sup>19,20</sup>. On the other hand Qasim et al, found 32.5% patients required aspiration only once, 45.0% patients needed aspiration twice and 22.5% needed aspiration for 3 times, which differ the current study may be due to the clinical presentation of their study patients were different.

In this present study it was observed that more than three fourth (76.6%) patients were in Glasgow outcome scale 4-5 followed by 16.7% had Glasgow outcome score 2-3 scale and 6.7% with scale 1. In this current study morbidity was 4(13.3%) and mortality was 2(6.7%). Similarly, Gorgan et al. found general morbidity was 26.19% and mortality stood at 7.14%. In another study Qasim et al. found there was no mortality recorded in their study. 82.5% patients have no clinical deterioration postoperatively.

The rate of morbidity was 12.3%. The above findings are comparable with the current study.

Glasgow coma scale (GCS) score at presentation was found significant determinant of outcome. In this study it was observed that 4(57.1%) patients were 14-15 GCS on admission in poor outcome group and 21(91.3%) in good outcome group. Mean GCS on admission was found  $13.0 \pm 2.45$  score in poor outcome group and  $14.39 \pm 1.12$  score in good outcome group. The mean GCS on admission was significantly ( $p < 0.05$ ) higher in good outcome group. Similarly, Zhang et al. found GCS on admission d"13 was 63.0% in favorable and 37.0% in unfavorable outcome<sup>18</sup>. GCS on admission 14-15 was found 81.0% in favorable and 19.0% in unfavorable outcome. The difference was not statistically significant ( $p > 0.05$ ) between two groups. In this study it was observed that 5(71.4%) patients with burr hole and aspiration were in poor outcome and 91.3% in good outcome group. The difference was not statistically significant ( $p > 0.05$ ) between two groups. Zhang et al. found 75.0% in favorable outcome and 25.0% in unfavorable outcome.

### Conclusion:

Burr hole and aspiration of intracerebral abscesses is feasible and safe, though some of the patients need multiple aspirations and it has a conversion rate to craniotomy and excision for total clearance. The procedure is and can be performed in emergency situations on patients of any age even under local anaesthesia. Therefore this study concludes that burr hole and aspiration remains safe and effective as the primary surgical intervention of intracerebral abscesses. The decision of this procedure depends upon initial size of the abscess.

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