



## BRAIN ABSCESS

**aetiological, clinical & surgical correlations to morbidity & mortality:  
A Clinical retrospective study of 32 Cases**
**Ahmed Radhi  
Obaid**

MBChB.FICMS, neurosurgical hospital.

**Riyadh Ahmed  
Abid**

MBChB.FICMS, neurosurgical hospital.

**Muhammed  
Hameed Faeadh**

M.B.Ch.B., F.I.B.M.S. Neurosurgery. Assistant prof. In Aliraqia University. College of medicine. Department of surgery.

**ABSTRACT**

Thirty two patients with brain abscess were studied (6 traumatic, 5 contagious, 9 hematogenous and 12 unknown causes). The average age was 27.5 year, male to female ratio 2:1. Headache present in most cases (53%), hemiparesis in (37.5%). WBC, ESR done in all cases. Culture was available in 26 cases (Staphylococcus 21.8%). CT-scan done in all cases, MRI in one, skull x-ray show a foreign body in two cases. 27 cases have a single lesion and 5 patients with multiple one, hydrocephalus found in 6 patients. Seven patients sustained a medical treatment (from the start), 4 with multiple and 3 have single abscess. Mortality rate was 42.8%. Twenty seven cases treated surgically (23 with aspiration alone, 2 with aspiration and excision and 2 with excision alone) with a mortality rate of 26%. The most common postsurgical complication was recurrence seen in 5 cases out of 23 who sustained an aspiration. The mortality rate for patients treated with late aspiration was higher than for patients treated with early one. The most important predictor of outcome was the patient's condition on admission.

**KEYWORDS :** words: brain abscess, CNS infection.
**Introduction:**

Significant advances in the diagnosis and management of bacterial brain abscess over the past several decades have improved the expected outcome of a disease once regarded as invariably fatal. Despite this, intraparenchymal abscess continues to present a serious and potentially life-threatening condition. Brain abscess may result from traumatic brain injury, prior neurosurgical procedure, contiguous spread from a local source, or hematogenous spread of a systemic infection(1'2'3)

**Aims of the study:**

1. Make a correlation between the etiology of brain abscess and mortality.
2. Make a correlation between the level of consciousness at time of admission and outcome.
3. Comparison between different types of surgical modalities.

**PATIENTS AND METHODS**

A 32 patients with brain abscess admitted in Neurosurgical Hospital and Specialized Surgical Hospital over 5 years period between 2012-2016.

Data collected regarding: Age, gender, chief complaint, signs and symptoms, level of consciousness, source of infection, radiological studies: skull x-ray, CT-scan, MRI, laboratory tests: ESR, WBC count and result of culture of pus obtained at surgery, site of abscess from CT-scan, medical treatment: antibiotics, steroid, type and time of surgical interference whether aspiration, excision or aspiration followed by excision, and mortality rate. The incidence for each data were calculated. The follow up was limited to period of admission and 3 months later.

**RESULTS**

1. Age: Average 27.5 year.
2. Gender: 22 male patients and 10 Female patients
3. Chief complaint: As shown in table 1.

**TABLE 1 chief complaint of patients with brain abscess**

Chief complain	No.	%
Headache	14	43.7
Vomiting	5	16.5
Seizure	4	12.5
Altered level of consciousness	4	12.5
Hemiparesis	3	9.4
Double vision	1	3
Ataxia	1	3

**4. Symptoms:****Table 2: symptoms of patients with brain abscess**

Symptoms	No.	%
Headache	17	53%
Fever	15	46.8%
Seizures	10	31%
Visual disturbances	8	25%
Vomiting	7	21.8%

**5. Signs:****TABLE 3 signs of patients with brain abscess**

Signs	No.	%
Hemiparesis / hemiplegia	12	37.5 %
Papilledema	11	34.3 %
Altered conscious level	9	28 %
Cranial nerves	6	18.7 %
Meningeal signs	4	12.5 %
Ataxia	2	6.25 %
Nystagmus	1	3 %
Dysphasia	1	3 %

**6. Sources of infection:**

**TABLE 4 Source of infection of brain abscess**

Source of infection		No.	%	Age (Year)
Hematogenous	TOF	5	15.6 %	5-12
	VSD	2	6.25 %	
	Bronchiectases	1	3 %	40-50
	Bronchogenic CA	1	3%	
Trauma		6	18.7 %	20-30
Otitis media and sinusitis		5	15.6 %	15-40
Unknown		12	37.5 %	15-30

**7. Site of abscess:**

**TABLE 5 Site of brain abscess**

Site of abscess	Number of patients			% of total
	right	Left	total	
Parietal	7	3	10	31.3 %
Frontal	5	4	9	28.1 %
Occipital	4	0	4	12.5 %
Temporal	2	1	3	9.4 %
Cerebellum	-	1	1	3.1 %
Multiple	-	-	5	15.6 %

**8. Diagnostic aids:**

**TABLE 6 Laboratory investigations results of patients with brain abscess**

Investigation	Result	No.	%
ESR	> 20	23	71.8 %
	< 20	9	28 %
WBC	< 11000 cells/mm3	12	37.5 %
	11000-15000 cells/mm3	19	61.3 %
	> 15000 cells/mm3	1	3 %

**8.2 Skull x-ray:**

We looked for: signs of increased ICP, opacification of paranasal sinuses, foreign bodies and intracranial air. In 2 patients skull x-ray showed a bony and missile fragments and 1 patient there was frontal sinus opacification.

**8.3 Culture study:** (available in 26 cases) It was done under aerobic technique,

**TABLE 7 Results of culture of brain abscess**

Culture result	No.	%
Staphylococcus	7	21.8 %
Streptococcus	4	12.5 %
Proteus	2	6.25 %
Mixed	1	3 %
Negative	12	37.5 %

**8.4 CT-scan:**

All patients in this study were scanned within 1-2 days of admission, pre-contrast and post-contrast CT-scan were available.

**TABLE 8 brain CT-scan findings of patients with brain abscess**

CT-scan findings	No.	%
Single Parenchymal Lesion	27	84.3 %
Multiple Parenchymal Lesion	5	15.6 %
Ring enhancement	29	90.6 %
Mass effect	17	53
Hydrocephalus	6	18.7
Foreign body	2	6.2

**8.5 MRI:**

Done in one case with proptosis of right eye with a long history of

penetrating trauma to the eye, during his admission the conscious level was deteriorated and brain MRI showed a multilocular large right parietooccipital abscess.

**9. Pathological results:**

Histopathological examination was available in 4 cases in which the results stated the lesion as a process of chronic inflammatory nature consistent with brain abscess. There was no fungal and parasitic brain abscess.

**10. Treatment:(Table 9)**

Nonsurgical: We used a triple antibiotics regime for 6 weeks with follow up (ampicillin 100mg/kg, metronidazole 30 mg/kg, and gentamicin 3-5 mg/kg) as a primary treatment for 7 patients. Of them, 4 cases with multiple abscesses (1 patient cured, one patient not responded treated with aspiration and 2 died) and 3 patients with a single abscess (one case cured, the other one treated with aspiration). Mortality rate with non-surgical treatment was 42.8%.

**TABLE 9 Response of patients with brain abscess to medical treatment**

Abscess No.	Patients No.	Response	% of death
Multiple	4	1 patient cured 1 case with no response( treated with aspiration ) 2 patients died	50 %
Single	3	1 patient cured 1 patient with no response(treated with aspiration) 1 patient died	33.3 %

Steroid used for short time in 7 patients with signs of mass effect with a temporary improvement.

**Surgical treatment:(Table 10)**

Aspiration through a burr hole done in 23 cases. In 18 cases aspiration done within 1-2days from admission, 17 patients with single abscess (13 improved, 1 not improved and 3 died) and 1 patient with multiple abscesses was mildly improved with no mortality. In 5 patients, aspiration done after 7 days, 4 with single abscess (one with good response and 3 died), and 1 patient with multiple abscesses with good response. Aspiration followed by excision done in 2 cases, one patient was mildly improved and the other died. An excision alone done in 2 patients with one patient improved with no improvement of the other one. Mortality rate with surgical treatment was 26%.

**TABLE 10 Surgical treatment and outcome of patients with brain abscess**

Treatment	Patient No.	Abscess No.	Full recovery	Persistent deficit	Mortality	% of death
Aspiration: 1-2 day	18		13	1	3	16.6 %
		>7day				
		17 single				0
		1 multiple	0	1	0	
Aspiration & excision	5	4 single	1	0	3	60 %
		1 multiple	0	1	0	0
Aspiration & excision	2	single	1	0	1	50 %
Excision	2	single	1	1	0	0

**11. Complications: Table 11**

**TABLE 11 Post-operative complications of brain abscess**

Complications	Aspiration No. %		Aspiration & excision No. %		Excision No. %	
Recurrence	5	21.7	0	0	0	0
Epilepsy	3	13	2	6.2	1	3.1
Neurological deficit	3	9.4	0	0	1	3.1
Meningitis	2	6.2	0	0	0	0

**12. Outcome and mortality:**

The mortality was influenced by many factors:

**1. Conscious level at the time of admission (Table 12):**

**TABLE 12. Relation of GCS to outcome and mortality of brain abscess**

GCS	No.	Recovery	Mortality	% of death
3-8	1	0	1	100 %
9-12	8	2	6	75 %
13-15	23	20	3	13 %

**2. Etiology: (Table 13)**

**TABLE 13 Relation of etiology to mortality of brain abscess**

Etiology	No.	Mortality	% of death	
Hematogenous	TOF VSD	7	2	28.6 %
	Bronchiactasis BronchogenicCA	1 1	0 1	0 100 %
Trauma		6	3	50 %
Otitis media and sinusitis		5	2	40 %
Unknown		12	2	16.7 %

**3. Surgical methods: (see Table 10)**

**DISCUSSION**

Brain abscess is common in men with a M:F ratio of 2:1, this is the same in all the etiological groups and is reported in literatures.(7'9'11) Brain abscess is common in the first three decades of life because of predisposition in this age group to trauma, cyanotic heart disease & middle ear infection. In this study, the common causes are cyanotic heart disease, post traumatic & chronic otitis media. Patients with cyanotic heart disease are usually young, chronically ill, emaciated and have symptoms dating to birth. Most of them are not operated and they are on inadequate antibiotics. In the study of Nielsen H. et al. & Rosenblum ML. et al. most patients are prone to brain abscesses because of associated polycythemia which may cause small infarction in the brain which provide an area for growth of organism.(14,15) Penetrating craniofacial trauma can result in brain abscess especially if there is a retained foreign body such as bone fragment, shell or an underlying wound infection. Chronic otitis media with discharging ear found in 4 patients, this incidence was low in comparable to literatures because of increase use of antibiotics and better medical care.(8,11,17) The study shows a low incidence of brain abscess from paranasal sinus infection. The cause was unknown in 37.5% in comparison with 15-20% in published series. In this study there is a slightly lower incidence of headache (53%) when compared with Sheldon Landesman study.(16) Seizure incidence (31.25%) approximately like the figure reported by Mampalam and Sheldon.(13,16) High incidence of papilledema in this study (34.3%) when compared to the study conducted by Garfield (22-26%).(12) This may be due to long history of presentation. Focal neurological deficit at presentation occurred in 22% of patients in this study, it has been reported in over 60% of patients in Mampalam TJ & Rosenblum ML. study.(13) Abnormal ESR & WBC with history of head injury & signs & symptoms of space occupying lesion might suggest the diagnosis. Normal ESR & WBC count do not exclude brain abscess. ESR has been reported as the

most reliable laboratory sign of inflammation by Berlit et al.(5) In this study, ESR above 20mm/h. seen in 71.8% of cases, it has been reported up to 90% in Nielsen H. et al. study,(14) this may be due to polycythemia seen in 7 patients with cyanotic congenital heart disease. The results of peripheral WBC count in this study was similar to the results reported by Mampalam and Rosenblum.(13) Skull x-ray may show foreign bodies, bone fragments, bullets and shells in cases of post traumatic brain abscess. Skull x-ray can also reveal signs of sinusitis and osteomyelitis. CT-scan is diagnostic in up to 90% of cases.(6) It demonstrates the early cerebritis stage and subsequent capsule formation and multiple abscesses. Serial CT-scan used for following up the patients and detection of post-operative complication.(6) MRI gives no information above CT-scan and also it is not done in patients with a history of penetrating head injury. The high mortality rate was reported in this study (31.25%) compared to Alderson D. et al. & Mampalam TJ & Rosenblum ML. studies.(4,13) due to delayed referral of patients, poor microbiological isolation. Pre operative neurological state was the most important factor affecting the outcome. Patients who were comatose preoperatively had a mortality rate significantly greater than that of patient who were alert and oriented at the time of diagnosis. The best result seen with early aspiration of brain abscess. Rosenblum ML. et al. have suggested that aspiration alone result in a high mortality compared with excision. However in most of these studies the patients were comatose preoperatively. Those treated by excision were more neurologically intact and with encapsulated abscesses.(15) In this study Five patients had multiple abscesses; of them, 2 patients died. Gormley W & Rosenblum M mentioned a high mortality rate 60% among patients with multiple abscesses.(10) Patients with bad neurological condition are best treated primarily by early aspiration which give good results compared to a delayed one. The Advantages of early aspiration are: Rapid decompression of large abscess & decreasing the raised ICP. It can be done at any stage of brain abscess evolution. It can be repeated through the same previous burr hole. It is suitable for both superficial and deep abscesses. Preferred surgical method for abscess in eloquent cortical areas or deep site in the brain. The disadvantage are: Dissemination along the subarachnoid space and the abscess may rupture into the ventricles & Recurrence several years after aspiration.

Craniotomy & Excision of encapsulated abscess gives good neurological condition especially with evidence of foreign body. The advantages of excision are: It was a definitive treatment. Used for multiloculated non-communicating abscess. Foreign body can be removed. The disadvantages of excision are: Neurological deficits are generally greater with excision because the surrounding edematous brain is often resected.

**CONCLUSIONS:** Congenital heart disease was the commonest source of brain abscess. Poor state of consciousness on admission associated with poor out come and carries high mortality rate. The Mortality rate for patients treated with late aspiration was higher than for patients treated with early one. The high recurrence rate may be due to inadequate surgical drainage or excision of abscess and not due to improper choice of surgical procedure. The Mortality rate with non surgical treatment was 42.8%, while with surgical one was 26%.

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