BRAIN ABSCESS: A REVIEW OF 41 CASES*

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ABSTRACT

Objective: The traditional treatment of brain abscess includes antibiotic therapy and surgical drainage or excision of the abscess. The treatment has still been controversial whether to aspirate or excise a brain abscess. We tried to find out the best treatment method in forty-one cases.

Methods: In this study, we present the treatment results of forty-one cases of brain abscesses Six of 41 cases were treated nonsurgically and 35 were treated surgically. In the surgically treated group, aspiration method was applied to 31 cases and total excision method was used in only 4 cases.

Results: Chronic otitis-mastoiditis was the major causative factor in the development of abscesses in 17 (42%) cases. S.aureus was the most common organism isolated in 9 (31%) of the brain abscesses. Abscess was single in 37 (90%) cases and multilocated in 4 (10%) cases. In this study, the aspiration, surgical excision and medical treatment methods were used in 31, 4 and 6 cases respectively. The mortality rate was 10%.

Conclusion: Although many treatment modalities are present in the literature, aspiration is the most preferable method because of low morbidity and mortality rates. This method not only provides the identification of the causative organism but also makes the treatment easier by decreasing the amount of the mass in the solitary abscesses with 3 cm in diameter and more. There is an increasing tendency to use aspiration as the first modality.

Key Words: Aspiration, Brain abscess, Computed tomography, Staphylococcus aureus.

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INTRODUCTION

Brain abscesses are parenchyma infections that may cause mass effect by destroying the neural tissue (1). Although the mortality rate was found to be 40-60%, it decreased dramatically with improved diagnostic modalities, early diagnosis, better bacteriological isolation techniques, improved antibiotics, early surgery, Computed Tomographic (CT) scanning, stereotoxic surgical techniques and preoperative ultrasound imaging (2-8). The introduction of CT provided not only to see the lesion, but also to know about its pathology and stage (5,8-12). Despite these technical advantages, brain abscess is still keeping its importance (8,10). The prognosis is related to the degree of brain damage as well as early diagnosis and adequate treatment (12).

MATERIALS AND METHODS

This report reviews forty-one consecutive patients with brain abscesses retrospectively who were diagnosed and treated between January 1988 and March 1994.

Age and sex of the patients, the localizations and the causes of the abscesses, presenting clinical features, neurological deficits and laboratory findings were recorded. CT scan was used in all the cases as the diagnostic method. Six of 41 cases were treated nonsurgically and 35 were treated surgically. In the surgically treated group, aspiration method was applied in 31 cases and total excision method was used in only 4 cases.

RESULTS

Twenty-six (63%) of 41 patients were male and the age ranged from 1.5 to 75 years (mean 28 yeas old). The brain abscesses were solitary in 37 (90%) and

multiple in 4 (10%). The diseases which led to abscess formations are shown in Table I. The localizations of the abscesses were supratentorial in 38 (93%) and infratentorial in 3 (7%) cases and were correlated with etiologic factors. Chronic otitismastoiditis complex was the main factor for brain abscess in 42%.

The temporal lobe and cerebellar hemispheres were the most involved lobes in 16 (39%) cases followed by the parietal (9 cases) and frontal (3 cases) lobes.

The symptoms of increased Intracranial Pressure (ICP) such as headache, nausea and vomiting, deterioration in consciousness were the most common complaints followed by focal neurological deficits and cerebellar symptoms. Six patients (15%) were admitted with uncal herniation.

The peripheral white blood cell (WBC) was elevated (11000/mm^3) in 23 cases (57%). The erythrocyte sedimentation rate (ESR) was also elevated in 23 cases (57%). CT scan densities of the brain abscesses were between 19-41 Haunsfield Unit and the diameters were between 8-68 mm. Eight patients had abscesses of 30 mm or smaller in diameter. Obstructive hydrocephalus was also observed in 3 (7%) cases.

The causative organisms were isolated cultured from the surgical specimens in 20 of 29 patients. No culture process was done in 6 of the nonsurgical treatment group and 5 of the surgical treatment group. Single microorganism was identified in 17 (42%) patients and multiple organisms in 3 (7%) patients. The identified organisms are shown in (Table II).

The diameters of the brain abscesses were 8-20 mm in nonsurgical treatment group (6 patients).

Thirty-one patients (75%) who had brain abscesses between 30-69 mm in diameter were treated with aspiration method. Four patients (10%) had total excision who had cortically located brain abscesses with 20-35 mm in diameter. V-P Shunt operation was performed on one patient who had hydrocephalus. External ventricular drainage was applied to another patient who had meningitis in combination with hydrocephalus.

There were no recurrance in excision group. In the aspirated group five patients underwent re-operation more than once due to recurrance.

Empricially, third generation cephalosporins, penicillin (penicillin G crystalline - potassium 24 million U/day) and anaerobic antibiotics such as metranidazole (15 mg/kg loading dose, 7.5 mg/kg q6h-500 mg q8h) and ornidazole (500-1000 mg q12h) were commonly used. The antibiotic regime was re-arranged according to the identification of the causative organism. Antibiotics were used at least 3 weeks as parenteral and later 3-5 weeks orally.

Dexamethasone was only administered to reduce the cerebral edema in 10 out of 41 patients.

Prophylactic anticonvulsive therapy was used in patients who had supratentorial cortical abscess.

The results of neurological examinations at admission and on discharge were graded according to Glasgow Coma Scale (GCS) (Table III).

Four patients died in the aspiration group. All of them were comatose on admission. The main pathology was generalize cerebritis in three patients and herniation in one patient. The mortality rate was found to be 10%.

On discharge, 33 cases were well and/or independent; 4 were dependent of living out of 37 patients (Table IV).

Twenty-three patients were followed up for 1-54 months (average 9 months). The late epileptic attack occurred two years later in a patient despite of prophylactic anticonvulsive therapy.

Table I : The etiology of the abscesses

Chronic otitis - mastoiditis	17	41.6
Posttraumatic	6	14.7
Postoperatively	2	4.9
Congenital heart disease		
VSD	1	2.4
Fallot tetralogy	1	2.4
Sinusitis	1	2.4
Osteomyelitis	1	2.4
Meningitis	1	2.4
Missile injury	1	2.4
Sepsis	1	2.4
Unknown	9	22
	41	100.0 (%)

Table II : Identified organisms

Organism	n	%
AEROBIC		
Staphylococcus aureus	9	31
Proteus spp	6	20.7
Alpha hemolytic streptococcus	1	3.4
Non - hemolytic streptococcus	1	3.4
Enterococcus	1	3.4
Mycobacterium tuberculosis	2	6.9
FUNGI		
Candida spp	1	3.4
ANAEROBIC		
Fusobacterium spp	1	3.4
Anaerobic streptococcus	1	3.4

Table III : Summary of cases according to GCS and treatment

GCS	n	nonsurgical	aspiration	excision	death
15	14	3	9	2	-
14 - 13	18	3	13	2	-
12 - 9	4	-	4	-	1
8 - 7	4	-	4	-	2
6 - 3	1	-	1	-	1
Total	41	6	31	4	4

Table IV : Summary of cases on discharge according to GOS *

Grade	n	%
I	**22**	**53.6**
II	**11**	**26.8**
III	**4**	**9.8**
IV	**-**	**0**
V	**4**	**9.8**

* GOS : Glasgow Outcome scale (29)

DISCUSSION

Brain abscesses are seen twice more in males (8,13). Our male-female ratio is 1.7 to 1. Direct spreading is the most common predisposing factor for brain abscess (20-40%) but surgery and congenital heart diseases are also seen as other frequent causes (3,14). There was no obvious cause in 22% of our patients that was between 10-37 in other series (4-6,11,13-15).

Increased peripheral WBC and ESR were found in 57% of the patients. Lumbar puncture was avoided in this study, because it has the risk of neurologic deterioration in 5 to 3% of the patients (3,14). CT scanning was performed in all cases. Multiple abscesses were observed in 10% of our patients. The incidence of multiple abscesses ranged from 1% to 15% before CT was started to be used. Multiple brain abscesses were reported more frequently, as much as 35% since CT was found (4). In infants, this ratio

was found to be 61% (16). Bacteroides, Staphylococcus and Streptococcus were the most common identified organisms (8,14). Garvey (17) emphasized the importance of Gram negative anaerobic bacilli and Bacteroides in cases of brain abscesses, particularly in mixed cultures of temporal lobe abscesses associated with otitis and sinusitis. We identified S. aureus. Proteus spp and anaerobic organisms (Fusobacterium spp and anaerobic streptococcus) 31%, 21% and 7% in our patients, respectively. These two anaerobic microorganisms were the most common cause of abscesses in the literature (8,15,18). In other series, multiple organisms have been identified as much as 33% and sterile cultures in 25-30% of patients. These were 10% and 32% respectively in our study. The combination of penicilin and chloramphenicol was advised by Everest and Gravy. In recent years, the combination of cefotaxim and nafcillin, which are effective against anaerobes and gram negative rods have been advised (14,17,19). We mostly used a third generation cephalosporin in combination with anaerobic antibiotics.

Since CT scanning became a diagnostic test, nonsurgical treatment of brain abscesses has been increased (11,20-22). Dyste and Rosenblum (4,11), emphasized that the nonsurgical treatment should be carried out in the abscesses particularly located in cortex 10-17 mm in diameter, but not the ones more than 42 mm in diameter. Mampalam (14) emphasized that the nonsurgical treatment should be considered for the abscesses average 20 mm in diameter and deeply located. Surgical treatment may be tried if the diameter of the abscesses are more than 30 mm (14).

We successfully treated the abscesses with 8-20 mm in diameter nonsurgically. Nonsurgical treatment was considered if the brain abscesses were multiple and smaller than 20 mm in diameter. Osenbach and Black suggested that surgery should be carried out despite sufficient antibiotic concentration for the abscesses more than 25 mm in diameter as well as for the patients who deteriorated and/or had ICP increase (8,23).

The personal experience of the surgeon is also important for choosing the surgical method as the patients' age, neurologic status with localization, stage and multiplicity of the brain abscess (24). Aspiration is advised as the first surgical method as it is easy, quick and requires no general anesthesia, has minimal surgical risk and reveals excellent results (4-8, 22,25-27). If it is available, stereotaxic surgery is also advisable. Excision is performed in some abscesses located in cerebellum and in the abscesses that are not cured with repeated aspirations as advised by others (5,6,15).

We performed aspiration drainage in 31 patients and excision in only 4 patients. The causes of the deaths in the literature were mainly the mass effect and edema with ventriculitis and septic thrombophlebitis (17,28). In these conditions, steroids were used despite decreasing antibiotic penetration and collagen deposition. Steroids inhibit the migration of leukocytes and diminish the effectiveness of host defense mechanisms that assist in containing the infection. Steroids are advised in whom significant mass effect is believed to be responsible for neurologic deficit until the neurologic condition stabilizes (8,22). We used steroids in 10 patients who developed neurological deterioration and hemiplegia due to diffuse cerebral edema and midline shift.

The late epilepsy was observed in 10-72% of the cases. It increased if the abscess has been located in frontal lobe and surgical excision has been performed (6,14). If the abscess was located cortically, antiepileptic therapy was administered until the epileptogenic activity disappeared in the EEG (8). The late epilepsy was observed only in one (3%) of our patients.

With the introduction of CT and new antibiotics, the mortality rate reduced to 4% (1,3-5,8,15,17). Stereotoxic surgery reduced the mortality to almost 0%(4). Our mortality rate was 10% and these were the comatose patients on admission. Similarly in the other large series, mortality was 40% in comatose patients with severe neurologic deficits (14).

In conclusion, nonsurgical therapy is considered with multiple abscesses, particularly in eloquent brain locations and smaller than 20 mm in diameter. Aspiration is the best treatment of choice as it is easy, quick, requires no general anesthesia, has minimal surgical risk and excellent results in the treatment of brain abscesses larger than 30 mm in diameter.

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