ORIGINAL RESEARCH

Evaluation of Two Surgical Methods for Treatment of Superficial Cerebral Abscess and Its Outcome at a Tertiary Care Centre

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ABSTRACT

Background: Brain abscess is a serious infection which can be metastasis of chronic suppurative diseases or a congenital cardiomyopathy, from an open head injury or from neurosurgical procedures, but they are more frequently seen in healthy adults suffering from chronic sinusitis or otitis. The present study was conducted to analyse two surgical methods used for treatment for superficial cerebral abscess and its outcome.

Materials and Methods: The present study was a retrospective study in which patients who were treated surgically for superficial cerebral abscess over a period of two years were included. In this study, all the patients who had undergone the burr hole procedure and pus aspiration are categorised in the "burr hole" group and patients who had undergone craniotomy or craniectomy and excision of the abscess with its capsule were categorised in the same "craniotomy" group. In this study the neurological status of the patients was assessed preoperatively and postoperatively. Data was collected and analysed.

Results: In this study 53.75% patients were males, and 46.25% patients were females. Mean age of patients was 38.7years. Altered sensorium was the most common clinical presentation among brain abscess patients (83.75%) The range of duration of symptoms prior to admission was mostly less than a week (57.5%). Based on the CT brain, the most common location for the abscess is the frontal region in 38 patients (47.5%). Out of 80 cases, 47.5% had undergone burr hole aspiration as their first surgical treatment and 52.5% cases had undergone craniotomy and excision of the abscess. In burr hole aspiration cases more patients shows i**mprovement of neurological status at one week**and 3 months than craniotomy excision**.** In burr hole aspiration cases 25% patients shows satisfactory radiological clearancewhereas in craniotomy excision, 48.75% patients shows satisfactory radiological clearance**.** In burr hole aspiration cases 26.25% patients needed repeat surgerywhereas in craniotomy excision, 2.5% patients needed repeat surgery**.**

Conclusion: The present study concluded that patients who had undergone craniotomy and excision of abscess showed a significantly earlier improvement in neurological function, better radiological clearance and lower rate of re-surgery as compared to the burr hole aspiration group.

Keywords: Craniotomy, Excision of Abscess, Neurological Function, Burr Hole Aspiration

INTRODUCTION

Brain abscess (BA) is a universal health problem with a high morbidity and mortality rate; thus, the disease today presents a leading public health problem and a major burden on health care facilities all around the world.[1,2] BA is a dynamic focal form of intracranial suppuration and a serious life-threatening emergency.[3] A brain abscess is defined as a focal suppurative process within the brain parenchyma.[4] They begin as localized areas of cerebritis in the parenchyma and evolve into collections of pus enclosed by a well vascularized capsule. Although there have been

breakthrough advances in neuroimaging, neurosurgical techniques, neuroanesthesia, microbiological isolation techniques and antibiotic therapy, bacterial brain abscesses can be fatal.[5-8]

The infectious origin of the BA causes significant damage to the CNS, because of its incapability of mounting a sufficient defense against the microorganism, leading to a pyogenic abscess.[9,10]The basic principles of brain abscess treatment are early diagnosis, prompt surgical removal of pus, simultaneous eradication of the primary source and high-dose intravenous antibiotics.[11] The present study was conducted to analyse two surgical methods used for treatment for superficial cerebral abscess and its outcome.

MATERIALS & METHODS

The present study was a retrospective study in which patients who were treated surgically for superficial cerebral abscess (SCA) over a period of two years were included. The database consisted of the patient's name, age, gender, date of operation, and operative diagnosis. From these data, all patients who were diagnosed as brain abscess post-operatively were included in the study.

Total 80 patients were included in the study. Patients who had intracranial supratentorial abscess >2.5 cm, stage 3 or 4 abscess (Britt Staging), superficial margin of the abscess <1 cm from the cortex, first surgical treatment for supratentorial abscess was either burr hole aspiration or craniotomy excision, patient's notes and CT brain films were available in the record office were included in the study.

Patients who had deep-seated or infratentorial abscess, preoperative American Society of Anesthesiologists (ASA) >3, less than 12 years old were excluded from the study. The burr hole and drainage procedure was defined as making a small opening in the skull using a twist drill (e.g. Hudson brace) up to a maximum diameter of 16 mm to allow a small opening of the dura mater so that a cannula could be inserted into the abscess to aspirate out the pus. In this procedure, pus was aspirated without any excision of its capsule. In this study, all the patients who had undergone the burr hole procedure and pus aspiration are categorised in the "burr hole" group. Craniotomy and excision of the abscess was defined as a surgical procedure with a wide opening of the skull and dura, which exposed the full margin of the abscess. A high-speed craniotome was used to allow evacuation of pus and excision of the abscess wall under direct examination. In this study, all patients who had undergone craniotomy or craniectomy and excision of the abscess with its capsule were categorised in the same "craniotomy" group. In this study the neurological status of the patients was assessed preoperatively and postoperatively. The neurological deficit after the first surgery was compared with the pre-operative status. Data was collected using a standardised questionnaire. Analysis of the data was done using SPSS version 12.0. P-value of < 0.05 was considered to be significant.

RESULTS

The present study was conducted among 80 patients over a period of two years. In this study 53.75% patients were males and 46.25% patients were females. Mean age of patients were 38.7years.

Altered sensorium was the most common clinical presentation among brain abscess patients(83.75%) followed by fever(70%) and headache(60%). The range of duration of symptoms prior to admission was mostly less than a week (57.5%); 30% of patients had symptoms for 1–2 weeks before seeking treatment in the hospital and 12.5% presented after 2 weeks. Based on the CT brain, the most common location for the abscess is the frontal region in 38 patients (47.5%). The other sites of abscess were in parietal (30%), temporal (11.75%), and occipital regions (8.75 %).

Out of 80 cases, 47.5% had undergone burr hole aspiration as their first surgical treatment and 52.5% cases had undergone craniotomy and excision of the abscess.

In burr hole aspiration cases 37.5% patients showsimprovement of neurological status at one week whereas in craniotomy excision, 21.25% patients shows improvement of neurological status at one week.In burr hole aspiration cases 48.75% patients shows improvement of neurological status at three monthswhereas in craniotomy excision, 41.25% patients shows improvement of neurological status at three months. In burr hole aspiration cases 25% patients shows satisfactory radiological clearance whereas in craniotomy excision, 48.75% patients shows satisfactory radiological clearance**.** In burr hole aspiration cases 26.25% patients needed repeat surgerywhereas in craniotomy excision, 2.5% patients needed repeat surgery**.**

Table 1: Demographic data

Variable	N(%)
Gender	
Male	43(53.75%)
Female	37(46.25%)
Mean Age(years)	38.7

Table 2: Clinical presentation

Clinical presentation	N(%)
Altered sensorium	67(83.75%)
Fever	56(70%)
Headache	48(60%)
Vomiting	35(43.75%)
Focal neurological deficit	27(33.5%)
Duration of symptoms	
1 week	46(57.5%)
1-2 week	24(30%)
After 2 weeks	10(12.5%)
Location for abscess	
Frontal	38(47.5%)
Parietal	24(30%)
Temporal	11(13.75%)
Occipital	78.75(%)

Table 3: Mode of treatment

Mode of treatment	N(%)
Burr hole aspiration	38(47.5%)
Craniotomy excision	42(52.5%)

Table 4: Association between surgical method and outcome

Outcome	Burr hole aspiration	Craniotomy excision	p-value
Improvement of neurological status at one week			
Yes	30(37.5%)	17(21.25%)	0.04
No	8(10%)	25(31.25%)	
Improvement of neurological status at three months			
Yes	39(48.75%)	33(41.25%)	0.687
No	3(3.75%)	9(11%)	
Radiological clearance			
Satisfactory	20(25%)	39(48.75%)	<0.001
Non satisfactory	18(22.5%)	3(3.75%)	
Repeat surgery			
Yes	21(26.25%)	2(2.5%)	<0.001
No	17(21.25%)	40(50%)	

DISCUSSION

BA is a focal intraparenchymal collection of pus and is classified based on the anatomical location or the etiologic agent causing it. It begins as a localized area of cerebritis and evolves into a collection of pus surrounded by a vascularized capsule.[12] BA occur often in the developed world, with an incidence of up to 2% of all space-occupying lesions. They are even more common in developing countries, with an incidence of up to 8%.[13,14]

In this study 53.75% patients were males and 46.25% patients were females. Mean age of patients was 38.7years. Altered sensorium was the most common clinical presentation among brain abscess patients (83.75%) The range of duration of symptoms prior to admission was mostly less than a week (57.5%). Based on the CT brain, the most common location for the abscess is the frontal region in 38 patients (47.5%). Out of 80 cases, 47.5% had undergone burr hole aspiration as their first surgical treatment and 52.5% cases had undergone craniotomy and excision of the abscess. In burr hole aspiration cases more patients show improvement ofneurological status at one weekand 3 months than craniotomy excision**.** In burr hole aspiration cases 25% patients shows satisfactory radiological clearancewhereas in craniotomy excision, 48.75% patients show satisfactory radiological clearance**.** In burr hole aspiration cases 26.25% patients needed repeat surgerywhereas in craniotomy excision, 2.5% patients needed repeat surgery**.**

Tan WM et al did a study to compare the two surgical methods (burr hole and craniotomy) used as treatment for superficial cerebral abscess and its outcome in terms of radiological clearance on brain CT, improvement of

neurological status, the need for repeated surgery, and survival and morbidity at three months after surgery. 64.7% of patients were male and 35.5% were female. Most of the patients were Malay (70.6%); 28 patients (54.9%) had undergone craniotomy and excision of abscess, and the rest had undergone burr hole aspiration as their first surgical treatment. This study reveals that patients who had undergone craniotomy and excision of abscess showed a significantly earlier improvement in neurological function, better radiological clearance and lower rate of re-surgery as compared to the burr hole aspiration group (P<0.05). However, with respect to neurological improvement at 3 months, morbidity and mortality, there is no significant difference between the two surgical methods.[11]

Ramesh Chandra VV, et al performed a study to assess clinical outcomes following surgical management of brain abscess in a tertiary care centre and found that in acute cases, common clinical features were headache, fever, vomiting, focal deficit and seizure. In chronic abscesses, common clinical features were mild to moderate headache and progressive focal deficit. In 12(21.42%) patients had adjacent localized sinus, middle ear infection. In 27(48.21%) patients no primary source of infection was identified, predisposing factors included post neurosurgery (8.92%), post penetrating injury (3.57%), and congenital heart disease, infective endocarditis, sinusitis. The frontal lobe involved in 28.5% cases, temporal lobe and cerebellum are next to be involved. Burr hole aspiration in 29(51.78%) cases, a craniotomy was done in 15(26.78%) cases. Pus culture was negative in 36 (64.28%) cases. Mortality was noted in 2(3.57%) cases. Complete resolution of the abscess with complete recovery of preoperative neuro-deficit was seen in 71.42% cases and recovery with major neuro-deficit was observed in 16.07% cases. The best outcome was seen with a better Glasgow Coma Scale (GCS) on admission.[15]

Jo SD et al performed a review of the clinical characteristics and operative results of brain abscess in order to define the therapeutic strategy for this disease. Twenty-seven (77.1%) patients presented with symptoms of increased intracranial pressure. The frontal lobe was the most common anatomical place, and streptococcal species were the most frequently encountered pathogens. The chronic pulmonary diseases and chronic otitis media are common underlying condition. Eighteen patients underwent stereotactic aspiration and 17 patients had excision of their abscess as an initial treatment. Seven patients had a repeated surgery, 6 of them had been treated with aspiration initially. At discharge, 60.0% patients showed a favorable outcome.[16]

CONCLUSION

The present study concluded that patients who had undergone craniotomy and excision of abscess showed a significantly earlier improvement in neurological function, better radiological clearance and lower rate of re-surgery as compared to the burr hole aspiration group.

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