International Journal of Research in Medical Sciences
Shilong DJ et al. Int J Res Med Sci. 2021 Jul;9(7):2067-2071
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20212315

Original Research Article

Intracranial suppurations surgically managed at Jos, North Central Nigeria: a nine-years retrospective review

Danaan J. Shilong*, Gyang M. Bot

Department of Surgery, Division of Neurosurgery, Jos University Teaching Hospital, Jos, Plateau State, Nigeria

Received: 01 May 2021
Revised: 26 May 2021
Accepted: 27 May 2021

***Correspondence:**
Dr. Danaan J. Shilong,
E-mail: shidanjos@yahoo.co.uk

ABSTRACT

Background: Intracranial suppurations are rare but can be fatal entities consisting of pus collection within the intracranial cavity. The aim of the study was to document the clinical and radiological findings in our patients and the outcome of treatment.
Methods: A retrospective analysis of all consecutive patients presenting to the Jos University Teaching Hospital from January 2012 to December 2019. Data of interest were retrieved from their folders and entered into SPSS version 22 and descriptive statistics run on the variables.
Results: There were 33 patients within this period, but only 21 had complete records and thus used for the analysis. The median age was 18 years (IQR=29), males accounted for 81% of the patients. The median time to presentation was 14 days (IQR=23). The most common cause of abscess in our series was trauma (surgical and non-surgical) in 38.1%, followed by contiguous spread from the ear or paranasal sinuses (23.8%). The most common symptom was fever occurring in 61.9%, followed by headache 42.8%. In two thirds of the patients, the abscess was intra-axial (the frontal lobe being the most common site). Patients were managed surgically with either a craniotomy (28.6%) or a burr whole (71.4%). A positive culture was obtained in 33.3% of cases.
Conclusions: Intracranial suppurations are uncommon, but can occur in the setting of predisposing factors. A high index of suspicion is required to clinch the diagnosis.

Keywords: Suppurations, Intracranial, Craniotomy, North Central Nigeria

INTRODUCTION

Intracranial suppurations are rare clinical entities which can become fatal if not diagnosed early or if improperly managed. An abscess refers to a focal infection consisting of encapsulated pus and pyogenic bacteria, or less commonly mycobacteria, fungi, protozoa, helminths.[1,2] The intracranial cavity is a sterile compartment surrounded by strong rigid barriers that prevent intrusion by microorganisms. These physical barriers include the rigid skull bone and the meninges especially the unyielding dura mater. In addition to these physical barriers are cellular defense mechanisms like the blood brain barrier and blood cerebrospinal fluid barriers which provide tight junctions that prevent the translocation of microorganisms from the blood and the cerebrospinal fluids into the brain parenchyma. In addition, resident macrophages, ependymal cells, microglial cells resident within the brain parenchyma are able to engulf microorganism and induce the recruitment of leucocytes into infected areas which enhance the removal of these organisms.[3] These barriers can however be breached following trauma as may occur in a road traffic accident, assault or following surgical procedures on the head for example a craniotomy. Organisms can also be translocated via the blood stream from distant sites commonly from the lungs as may occur in lung suppurations like lung abscess, bronchiectasis, pneumonia; from the heart like in congenital heart disease,

endocarditis; abdominal and pelvic infections, transplantation and intravenous drug use.[4] There can also be a direct spread from contiguous structures as may occur in paranasal sinus infection, mastoiditis, chronic suppurative otitis media, osteomyelitis of the skull like in Pott's puffy tumour, infections of the scalp, orbital cellulitis. Spread from contiguous structures occur as a result of thrombophlebitis of the emissary veins, leading to suppurations within the intracranial cavity. Sometimes organisms are able to reach the brain via the blood cerebrospinal fluid barrier which is mediated by the choroid plexus.[5] Once within the intracranial cavity, the organisms induce both cellular and humoral immune responses that establish an inflammatory process and eventual formation of pus. The pus collection may occur in the extra-axial compartments like the epidural, subdural and interhemispheric spaces or in the brain parenchyma and this is called a brain abscess. Intraventricular abscess is very rare and more often arises from rupture of an intra-parenchymal abscess and is associated with poorer prognosis.[6] The process of abscess formation within the brain substance goes through roughly four stages and these stages correspond to the age of the ongoing inflammation and also to the finding on imaging. These stages are the: early cerebritis (days 1-3), late cerebritis (days 4-9), early capsule (days 10-13), late cerebritis (days 14 or more).[7,8]

The epidemiology of intracranial abscesses is highly variable. About a third to half of cases involve the paediatric population (N=8). The prevalence and mortality associated with this condition is on a steady decline in advanced countries due to availability of resources for early detection and treatment but still a major problem in developing countries.[8] The organisms causing the abscess are often polymicrobial with specific organisms cultured depending on the aetiology of the abscess and the age of the patient.

The clinical presentation is nonspecific: the classic triad of fever, headache and focal neurological deficit is seen in only about 20% of cases; thus, high index of suspicion is required to make a diagnosis.[9] The diagnosis and management of brain abscess has changed over the recent years with the availability of non-invasive investigations, antimicrobials that are able to penetrate the blood brain barrier and minimally invasive surgeries.[4]

The objective of this study was to describe the clinical and radiological characteristics of patients with this condition in our setting and the immediate outcome of our surgical intervention.

METHODS

Study type

Our study was a retrospective cross-sectional study of all consecutive patients from January 2012 to December 2019.

Study area

The study was done at the Jos University Teaching Hospital which is a tertiary hospital with about 600 beds, serving the state and also receives referrals from surrounding states. Jos is a cosmopolitan city and the capital of Plateau State, North Central Nigeria. It has a population of about 917,000 according to the United Nations Population projection. This study was carried out in November 2020.

Selection criteria

We included all consecutive patients with intracranial abscess confirmed on cranial CT-scan or MRI and who had surgical intervention during the study period. We excluded those that were managed non-surgically or who did not have complete medical records.

Procedure

The case notes of the patients included in the study were retrieved and information regarding their demography, clinical presentation, radiological findings and type of surgical management were extracted from these case notes and then entered into a proforma from where the data was then transferred to the Statistical package for the social sciences (SPSS) version 26 spreadsheet. Ethical approval was not required for this study.

Data analysis

Analysis of the data was done using SPSS version 26. Descriptive statistics were then run on the parameters of interest. Age and duration of symptoms were summarized as median and interquartile range.

RESULTS

In the period from January 2012 to December 2019, thirty-three (33) patients had surgical drainage of intracranial abscess. There was a total of 1315 operated neurosurgical cases within this period, giving rise to 2.5% of operated neurosurgical patients. Only 21 patients had complete records and these were the ones used for subsequent analysis. The males accounted for 81% of the patients, the median age was 18 years (interquartile range of 29 years). The median duration of symptoms prior to presentation was 14 days (interquartile range 23 days). The most common cause of abscess in our series was trauma (surgical and non-surgical) in 38.1%, followed by contiguous spread from the ear or paranasal sinuses (23.8%), meningitis (14.3%). The most common symptom was fever occurring in 61.9%, then headache 42.8%, seizures 42.8%, altered consciousness 33.3% and hemiparesis 28.6%. In two thirds of the cases, the abscess was intra-axial (the frontal lobe being the most common site), whilst one third was extra-axial. The patients were managed surgically with either a craniotomy (71.4%) or a burr whole (28.6%). A positive culture was obtained in

33.3% of cases. Figure 1-4 show different types of abscesses based on their locations.

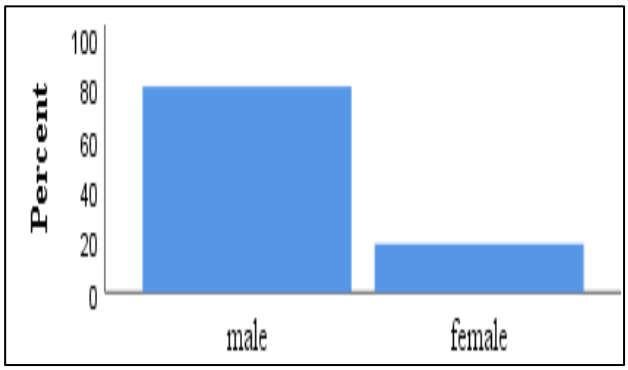

Figure 1: Sex distribution of the patients.

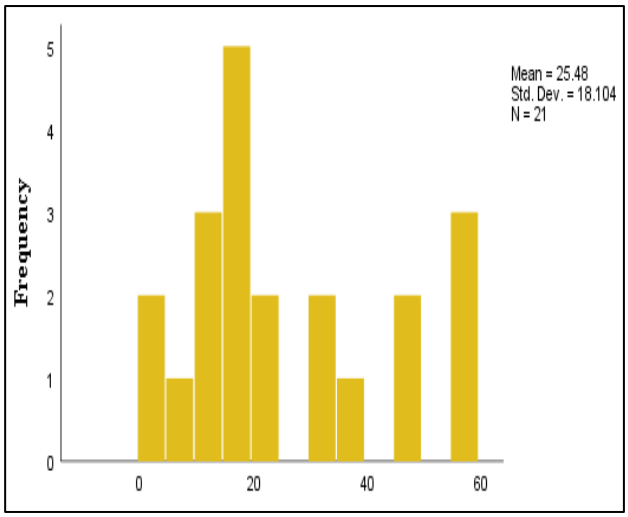

Figure 2: The age distribution of the patients.

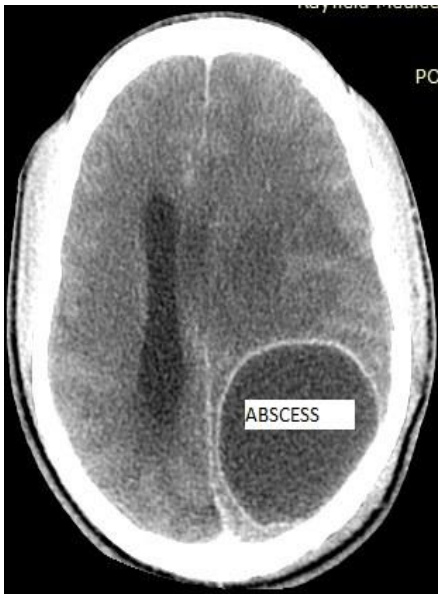

Figure 3: Contrast enhanced CT scan showing a huge left parieto-occipital intracerebral abscess with effacement of ipsilateral ventricle.

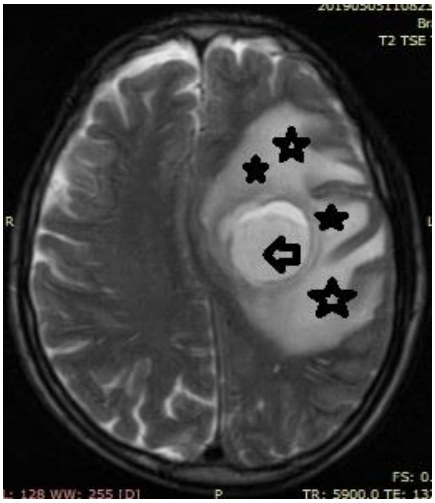

Figure 4: T2 TSE MRI showing a deep-seated intracerebral abscess (arrow) with extensive surrounding oedema (stars).

Figure 5: Contrast enhanced CT scan showing right convexity (stars) and parafalcine (arrow) subdural empyema.

Figure 6: T1-SE axial MRI showing bilateral intraventricular abscess (arrows).

DISCUSSION

Our results reveal the relative rarity of intracranial suppurations amongst neurosurgical cases accounting for just about 2.5% of all our operated neurosurgical cases. Globally, the incidence is put at 0.3-1.3 per 100,000 population across all age groups and for the paediatric age group it is put at 0.5 per 100,000 population with a male preponderance.[1,9,10] One of the earliest documentation of brain abscess in Nigeria was that by Osuntokun describing an incidence of 78 brain abscesses out of 9600 patients over a 12-years period from 1957-1969 giving a hospital incidence of 67 per 100000 patients per annum.[11] The median age of presentation in our series was 18 years. This is similar to other studies done in northern and southern Nigeria and elsewhere.[7,12-14] Some other studies however found a higher mean age.[2,10,15] The young age for development of intracranial abscess in our series may be related to our relatively young population compared to that in more developed countries where the proportion of the elderly persons is relatively larger. Our patients had their symptoms for about two weeks before presenting to the hospital. Thus, the bulk of our patients present when the abscess has matured and would most likely require surgical intervention. Other studies show that the time to presentation is highly variable.[15-18] Duration of symptoms less than one week is associated with a favourable response to medical therapy when compared with symptoms greater than one week prior to presentation.[4]

The most common predisposing factor in the causation of intracranial suppuration in our series was trauma (38.1%) closely followed by spread from contiguous structures (23.8%). This is similar to other studies showing trauma as the most common aetiological factor.[13,14,19] Some other studies are varied in the most frequent aetiological factor.[1,4,16,20] Clinical presentation is highly varied and non-specific. The most common symptoms in our patients revealed fever as the most common symptom (61.9%), followed by headache (42.8%), then seizure (42.8%). The classical features consisting of fever, headache and focal neurological deficit is seen in only about 20% of cases.[1,2,16,21,22] The most common location of the abscess is the frontal area (33%). This is similar to the findings in many other studies.[13,14,16,23] Our treatment protocol is multimodal combining intravenous antibiotics and surgery. Our typical antibiotic combination is intravenous ceftriaxone and metronidazole for two weeks and then continuing on oral cefixime of ceftazidime and metronidazole for another 4 weeks. Sometimes we add intravenous vancomycin when we suspect the organism may be staphylococcus. We do surgeries for well encapsulated abscesses 2.5 cm or more in diameter. Burr hole aspiration is our treatment of choice at the first instance but we reserve craniotomy for recurrence or interhemispheric subdural empyaemas. Though stereotactic aspiration is the recommended surgical approach especially for deep seated abscesses, this facility is not available in our facility and so we rely on measuring the coordinates of the abscess from a reference point and choose a trajectory that is short and does not traverse a critical area of the brain. We did burr hole aspiration in 71.4%, while craniotomy was done in 28.6% of the patients. Kanu et al in Lagos, Nigeria described a technique of aspirating the abscess via the lateral angle of a patent anterior fontanelle in infants without doing a burr hole using plastic cannula and trocar in patients with supratentorial brain abscess.[24] This method has been found by them to be more cost-effective. Another option of surgical treatment of an abscess is craniotomy and resection of the abscess. Zhai et al in their review found that abscess resection when compared to burr hole aspiration was associated with lower post-operative residual abscess rate, lower re-operation rate and higher rate of neurologic improvement within 1 month after surgery, shorter duration of antibiotic use and hospital stay.[25] However, this option is associated with longer duration of surgery and bleeding and there is no statistical difference in the rate of improvement in neurological status after 3 months and in the mortality. Organisms were isolated only in one third of our cases of which staphylococcus species was the most common cultured. We had a recurrence rate of 23.8% for which repeat aspiration or craniotomy was done. We had 1 death giving a mortality rate of 4.8%.

Our study had limitations. We excluded patients that were managed nonsurgical and thus it may not be a true reflection of the burden of this condition in our facility. We do not routinely do culture for atypical organisms like fungi or mycobacteria from the aspirates except in a situation of a strong suspicion. It is therefore possible that we may be missing these possible causes of abscesses. Again, we did not set out to measure the long-term outcome of our surgical intervention.

CONCLUSION

A high index of suspicion is necessary to make the diagnosis of an intracranial suppuration. The presence of fever, headache, convulsions and or a focal neurological deficit should raise the suspicion of an intracranial suppuration in our environment.

ACKNOWLEDGEMENTS

Authors would like to thank Dr. Dumura J. Alfin for going through the manuscript and offering very useful suggestions.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Weinberg GA. Brain Abscess. Pediatr Rev. 2018;39(5):270-2.
2. Brouwer MC, Coutinho JM, van de Beek D. Clinical characteristics and outcome of brain abscess:

systematic review and meta-analysis. Neurology. 2014;82(9):806-13.
3. Klein RS, Garber C, Howard N. Infectious immunity in the central nervous system and brain function. Nat Immunol. 2017;18(2):132-41.
4. Brook I. Microbiology and treatment of brain abscess. J Clin Neurosci. 2017;38:8-12.
5. Schwerk C, Tenenbaum T, Kim KS, Schroten H. The choroid plexus-a multi-role player during infectious diseases of the CNS. Front Cell Neurosci. 2015;9:80.
6. Gadgil N, Chamoun RB, Gopinath SP. Intraventricular brain abscess. J Clin Neurosci. 2012;19(9):1314-6.
7. Singh Y, Gupta TK, Jaiswal G, Lodha K. Intracranial Abscesses: An Institutional Study. Open J Mod Neurosurg. 2020;10(2):297-306.
8. Chen M, Low DCY, Low SYY, Muzumdar D, Seow WT. Management of brain abscesses: where are we now?. Childs Nerv Syst. 2018;34(10):1871-80.
9. Bodilsen J, Brouwer MC, Nielsen H, Beek VDD. Anti-infective treatment of brain abscess. Expert Rev Anti Infect Ther. 2018;16(7):565-78.
10. Simjian T, Muskens IS, Lamba N, Yunusa I, Wong K, Veronneau R, et al. Dexamethasone Administration and Mortality in Patients with Brain Abscess: A Systematic Review and Meta-Analysis. World Neurosurg. 2018;115:257-63.
11. Osuntokun BO. The pattern of neurological illness in tropical Africa. Experience at Ibadan, Nigeria. J Neurol Sci. 1971;12(4):417-42.
12. Jimoh AO, Matthew M, Guga DA, Sale D, Giwa FJ, Aruna AA. Intracranial Abscesses in Ahmadu Bello University Teaching Hospital. AASCIT J Med. 2016;2(1):5-9.
13. Udoh D, Ibadin E, Udoh M. Intracranial abscesses: Retrospective analysis of 32 patients and review of literature. Asian J Neurosurg. 2016;11(4):384.
14. Anwary MA. Intracranial suppuration: Review of an 8-year experience at Umtata General Hospital and Nelson Mandela Academic Hospital, Eastern Cape, South Africa. S Afr Med J. 2015;105(7):584-8.
15. Muzumdar D, Jhawar S, Goel A. Brain abscess: an overview. Int J Surg. 2011;9(2):136-44.
16. Helweg LJ, Astradsson A, Richhall H, Erdal J, Laursen A, Brennum J. Pyogenic brain abscess, a 15 year survey. BMC Infect Dis. 2012;12:332.
17. Patel K, Clifford DB. Bacterial brain abscess. Neurohospitalist. 2014;4(4):196-204.
18. Olorunmoteni OE, Onyia CU, Elusiyan JBE, Ugowe OJ, Babalola TE, Samuel I. Intracranial abscesses in children at Ile-Ife, Nigeria: a case series and review of literature. Childs Nerv Syst. 2020;36(8):1767-71.
19. Bodilsen J, Dalager PM, Beek VDD, Brouwer MC, Nielsen H. Risk Factors for Brain Abscess: A Nationwide, Population-Based, Nested Case-Control Study. Clin Infect Dis. 2020;71(4):1040-6.
20. Widdrington JD, Bond H, Schwab U, Price DA, Schmid ML, Carron B, et al. Pyogenic brain abscess and subdural empyema: presentation, management, and factors predicting outcome. Infection. 2018;46(6):785-792.
21. Sonneville R, Ruimy R, Benzonana N, Riffaud L, Carsin A, Tadie JM, et al. An update on bacterial brain abscess in immunocompetent patients. Clin Microbiol Infect. 2017;23(9):614-20.
22. Penna PA, Roos KL. Bacterial Infections of the Central Nervous System. Semin Neurol. 2019;39(3):334-42.
23. Khan IU, Latif A, Ashraf M, Chishti MK, Sadiq S. Outcome of management of brain abscess in children. Pak J Med Sci. 2020;36(3):306-9.
24. Kanu OO, Esezobor CI, Ojo OA, Asoegwu CN, Nnoli C, Dawang Y, et al. Infantile supratentorial subdural empyema managed by percutaneous aspiration: an outcome study in a Nigerian city. Sudan J Paediatr. 2019;19(1):37-43.
25. Zhai Y, Wei X, Chen R, Guo Z, Singh R, Zhang Y. Surgical outcome of encapsulated brain abscess in superficial non-eloquent area: A systematic review. Br J Neurosurg. 2016;30(1):29-34.

Cite this article as: Shilong DJ, Bot GM. Intracranial suppurations surgically managed at Jos, North Central Nigeria: a nine-years retrospective review. Int J Res Med Sci 2021;9:2067-71.