

BRAIN ABSCESS DUE TO *STAPHYLOCOCCUS AUREUS* FOLLOWING NEONATAL BREAST ABSCESS: CASE REPORT AND A BRIEF REVIEW OF THE LITERATURE

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Although brain abscess still continues to be a common condition,¹⁻⁵ it is rare in neonates.^{6,7} Excluding patients with cranial or spinal dermal sinus, *Staphylococcus* brain abscess in infants is rare as well. We present an infant with staphylococcal brain abscess secondary to a neonatal breast abscess and highlight the unusual heretofore unreported presentation and possible complications.

Case Report

A 2-month-old male infant was transferred to us from a local hospital with a one-day history of fever, lethargy, altered level of consciousness, and generalized tonic clonic seizures. There was no history suggestive of cyanotic heart disease and pulmonary or cardiac infection. However, at the age of 3 weeks this infant had developed pyogenic mastitis, which soon developed into a breast abscess necessitating incision and drainage at a local hospital. The pus culture had grown *Staphylococcus aureus* sensitive to cloxacillin, which was given to the infant initially intravenously for 5 days and then orally for 10 days. Examination at the local hospital had revealed the patient to be febrile, lethargic and drowsy. Pupils were normal and there were no focal neurological deficits except for the neck stiffness. There was no evidence of dermal sinus anywhere in the body nor any portal of entry of infection. A diagnosis of meningitis was entertained and a lumbar puncture was carried out, which revealed frank pus. Pus smear showed gram-positive cocci, which grew *Staphylococcus aureus*.

Examination on admission to our hospital revealed high-grade pyrexia and tachypnea. There was no focal neurological deficit. Fundi revealed bilateral early papilledema and the anterior fontanelle was tense. Blood investigation showed 11.2 g% hemoglobin. Total leukocyte count was 18,400/dL, and the differential count revealed 88% neutrophils. The blood test for HIV was negative and the chest x-ray was normal. However, no blood cultures were done as the patient was only febrile for one day, and

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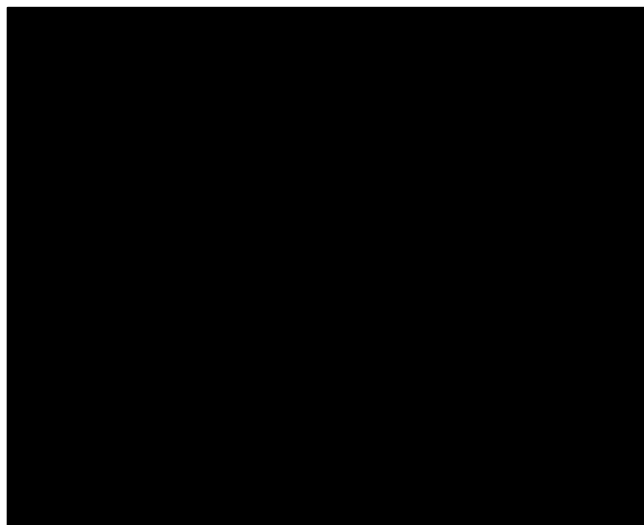


FIGURE 1A. Plain CT brain scan.

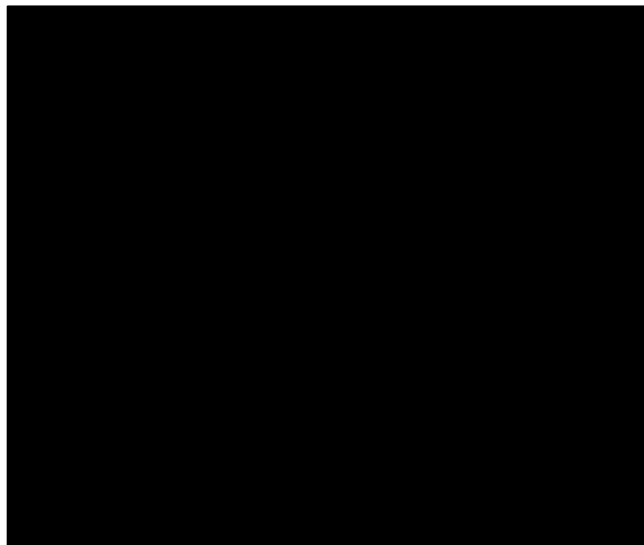


FIGURE 1B. Contrast-enhanced CT brain scan showing a large left frontoparietal brain abscess with surrounding edema and mass effect.

there was strong suggestion of meningitis. Plain and contrast-enhanced CT scan of the brain revealed left frontoparietal large brain abscess, with surrounding edema

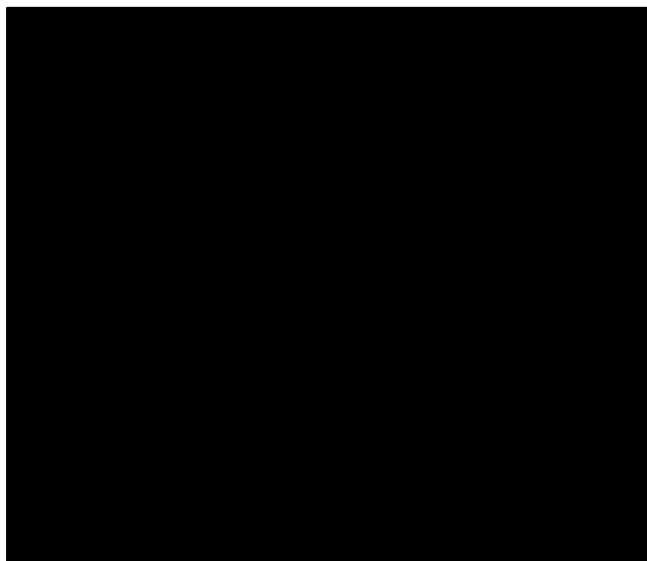


FIGURE 2A. Plain CT scan after aspiration of the abscess.

and midline shift (Figures 1A and B). An emergency aspiration was undertaken, through a left frontal burr hole under general anesthesia and about 35 mL of thick yellow pus was evacuated. Pus smear showed gram-positive cocci and culture grew *Staphylococcus aureus* sensitive to a large number of antibiotics, including cloxacillin and cephalosporines. The patient received intravenous ceftriaxone and cloxacillin for 7 days. Subsequently, his temperature became normal and the level of consciousness improved. A repeat CT scan on the 7th postoperative day revealed residual left frontoparietal abscess (Figures 2A and B) with evidence of ventriculitis and mild ventricular dilatation. The CT scan also revealed multiple peripheral cerebellar infarcts (Figure 3) at this stage.

Following re-aspirations, the left frontoparietal abscess was resolved. After 3 weeks of intravenous antibiotics (ceftriaxone and vancomycin) the patient was shifted on to oral cloxacillin 125 mg 6 hourly, as the organisms were sensitive to ceftriaxone, vancomycin and cloxacillin. The patient's clinical condition improved slowly over the next two weeks, however, head circumference was progressively increasing, despite resolution of the brain abscess. A repeat contrast CT brain scan (3 weeks after the second surgery) revealed a block at the left foramen of Monro and intraventricular frontoparietal septae trapping the left frontal horn and isolating the main body, occipital and temporal horns of the left lateral ventricle. Via a left frontal craniotomy using microsurgical techniques the left frontal horn was opened and all the septae at the foramen of Monro and left lateral ventricle were incised and excised, so that the communication could be established between lateral ventricle and the third ventricle. The septum separating and isolating the left lateral ventricle from its frontal horn was totally excised, allowing the rest of the lateral ventricle to communicate with the left frontal horn and the third

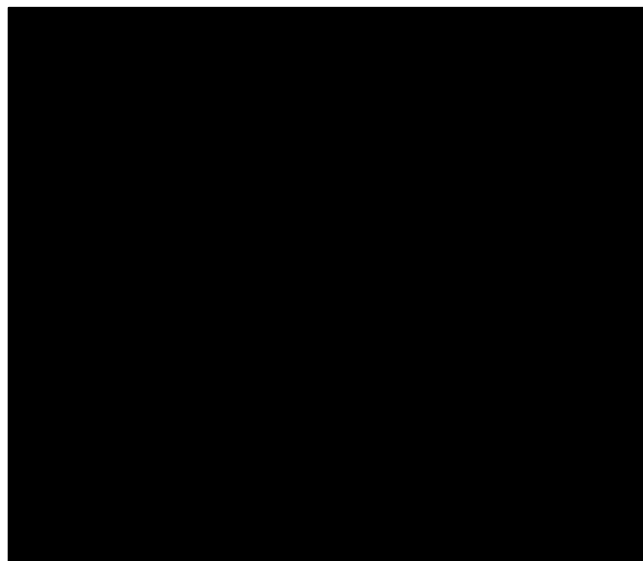


FIGURE 2B. Contrast CT scan showing residual left frontoparietal abscess with evidence of ventriculitis and moderate hydrocephalus.

ventricle. Following this operation, the patient's head size reduced and he had an uneventful postoperative recovery. Total period of antibiotic therapy was three months, out of which 4 weeks were intravenous antibiotics and 8 weeks were oral cloxacillin. The patient showed progressive improvement and his milestones were normal. At follow-up 9 months later the patient was doing well, and was seizure-free.

Discussion

Brain abscess is not an uncommon condition. In the USA every year 1500 to 2500 patients are treated for it,¹ and some authors have reported an increasing incidence.²⁻⁵ Surprisingly, brain abscess is a rare condition in neonates and infants.^{2,6-9} Only a few large series have been published in the literature.^{7,10}

Common causes of brain abscess are sinusitis, otitis media, osteomyelitis and pulmonary infections.^{1,2,4,11} However, in infants and neonates common causes are neonatal meningitis and septicemia.^{7,10,12,13} In a series of 30 cases, Renier et al.⁷ reported meningitis in 20 patients and septicemia in 13. In rare cases brain abscess can be a complication of cyanotic heart disease, compound head injury and ventriculoperitoneal shunts in children.^{2,4,6,9,19} In our patient, there was a history of neonatal mastitis with breast abscess, which was drained and had pus which grew *Staphylococcus aureus*. Thus, the present case is a unique report of a brain abscess secondary to a neonatal breast abscess. In 75% of cases, the duration of brain abscess is less than 2 weeks.¹ In rare instances, the patient may deteriorate suddenly due to subarachnoid or intraventricular rupture of the brain abscess,^{6,15} as in our case.

The general presentation of patients with brain abscess includes focal deficits in 50%-80%, high-grade fever in

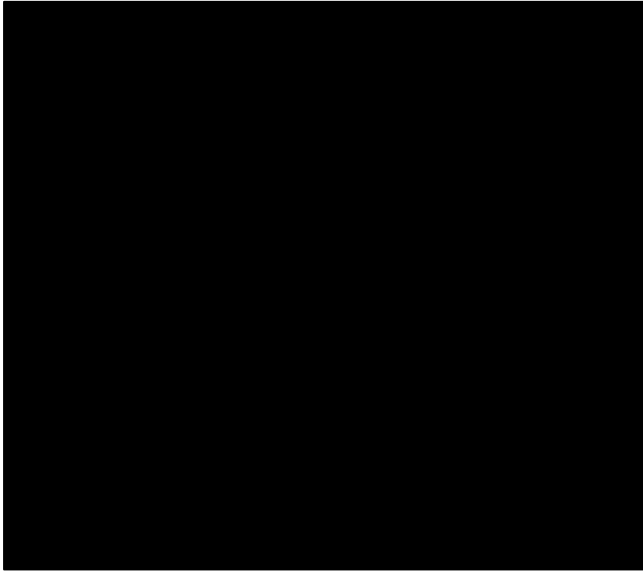


FIGURE 3. CT brain showing multiple cerebellar infarcts.

50% and signs of meningitis in 20% of cases.^{1,3,4,11} In children, common presentations are septicemia, meningitis and seizures.^{6,7,10,12} Our patient presented with a very short history of fever, altered sensorium, convulsions and meningitis following the surgical treatment of an ipsilateral breast abscess.

Common organisms in neonatal meningitis and brain abscess are reported to be *Proteus mirabilis* and *Serratia marcescens*.^{6,7,12-17} In rare cases, *enterococci* have also been isolated from the pus of neonatal brain abscesses.^{12,18} Staphylococcal meningitis or brain abscess in neonates or infants is a rarity and is by and large secondary to a dermal sinus.^{19,20} In the present case of breast abscess, CSF and brain abscess, all three grew *Staphylococcus*, strengthening our impression of breast abscess being the etiology of the intracranial infection. However, we did not have blood cultures to prove staphylococcal bacteremia.

Clinical features, supported by ultrasound evaluation and CT brain scan findings, usually confirm the diagnosis^{7,10,12,15} and ultrasound also helps in aspiration of the brain abscess.²² CT scan is invaluable in diagnosis, evaluation of multiplicity and in establishing the associated pathology such as ventriculitis, hydrocephalus and infarct.^{7,12,15,17} In our case, CT helped in evaluating the abscess following aspiration and revealed multiple cerebellar infarcts, and septate ventricles with hydrocephalus. Recently, MRI scans have been helpful in the diagnosis of intracranial infection. However, as the MRI facility is not available in our hospital, it was not performed in our case. In a series reported by Renier et al.,⁷ the frontal lobe was involved in 22 out of 30 cases, 12 had unilateral and 10 had bilateral frontal lobe involvement. Multiple brain abscesses were observed in 17 cases. Hervas et al.¹⁷ reported multiple brain abscesses in a neonate, due to *Proteus mirabilis*, which were treated with intravenous antibiotics alone.

Porencephalic cyst and hydrocephalus are not uncommon^{7,17} in patients with neonatal brain abscess. Renier et al.⁷ reported ventricular dilation in 13 of their 30 cases, on first CT scans. A high incidence of hydrocephalus is explainable due to the presence of associated concurrent meningitis, in a large number of neonates. Overall mortality is still high in patients with brain abscess, ranging from 10%-37%.^{1,2,4,7,23} The factors responsible for the poor outcome are advanced age of the patient, level of consciousness, multiplicity of the brain abscess, presence of multiple organisms in pus culture and hematological etiology such as septicemia or cyanotic heart disease. In patients with neonatal brain abscess, presence of meningitis is an important prognostic factor. Renier et al.⁷ reported the following good prognostic factors in neonatal brain abscess: sterile CSF, normal ventricle on CT scan, absence of seizure and early aspiration of the abscess. In our patient, poor prognostic factors included seizures, meningitis, ventriculomegaly and multifocal cerebellar infarct.

The long-term outcome of neonates with brain abscess is not very promising.^{7,12,15,17,24,25} Carey et al.²⁴ reported impaired scholastic ability in 70% of children tested 6 years after surgery. It also seems that the younger the child at the time of diagnosis, the worse is the prognosis for intellectual development. From this angle, neonates are the worst sufferers. Buonaguro et al.,²⁵ in 1989, had noticed the deficit in emotional status and vocational ability in children treated for brain abscess. Hervas et al.¹⁷ reported psychomotor retardation in a child at one year of age, who was treated for neonatal brain abscess. Renier et al.⁷ performed IQ testing in 22 children—among them eight had an IQ above 80 and another eight patients had an IQ less than 60. Thus there is a very high risk of mental subnormality in these children. Initially our patient continued to have occasional seizures in the first three months following discharge, but when last seen nine months after surgery, he was seizure-free, with normal milestones.

Neonatal brain abscess due to *Staphylococcus aureus* is rare. Early diagnosis and quick evacuation of a brain abscess with adequate and appropriate antibiotics is the key to a successful outcome. Breast infections in neonates should be vigorously treated to prevent serious metastatic infections such as meningitis and brain abscess, with their attendant avoidable mortality and long-term morbidity.

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