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GAS-PRODUCING BRAIN ABSCESS

Arshad A. Siddiqui and Khalid N. Chishti

ABSTRACT

A case of a known psychiatric patient who presented with rapid neurological deterioration is reported. Neuroimaging revealed a gas-producing brain abscess in left parietal lobe with a contiguous focus of infection in the adjacent bone and scalp initiated by obsessive scalp scratching. On complete surgical excision of abscess, followed by culture-based antibiotic therapy, a good neurological recovery was achieved with minimal residual deficits at follow-up.

KEY WORDS: *Brain abscess. Gas-producing abscess. Management. Neuroimaging.*

INTRODUCTION

Gas-producing brain abscess are extremely rare.^{1,4} Clostridium is the most frequent organism.^{1,2} In most cases, a dural defect extending to a contiguous focus of infection is the main cause^{1,2}, generally produced by trauma, surgery or tumoral erosion, with the lungs being a primary focus for the latter.^{1,2,4}

We report a case of brain abscess containing gas forming bacteria, which is contiguous from a trivial recurrent scalp wound, produced by obsessive scratching habit of patient due to nature of her psychiatric illness. Radiological imaging, microbiology and peculiar surgical implications are described.

CASE REPORT

A 35-year-old female presented with focal seizures on right side of body followed by right-sided hemiparesis for 5 days. She developed speech inability, visual disturbance, recurrent vomiting and double incontinence for 2 days prior to admission. The patient was mentally retarded. On physical examination, Glasgow Coma Scale was found 10/15 with expressive dysphasia. Pupils were equal (3mm) and reacting. Fundoscopy revealed bilateral florid papilloedema. She had a right-sided hemiparesis (power 2/5 BMRC scale) and ipsilateral 7th nerve upper motor neuron palsy. Her total leukocyte count was 15000cmm/dl with predominant neutrophilia (90%) and erythrocyte sedimentation rate (ESR) 75 mm.

Plain X-ray films of skull showed a pocket of air with fluid level inside the cranial cavity (Figure 1). CT scan of brain revealed ring-enhancing lesion in the left parietal lobe with hypodensity inside the lesion suggestive of a brain abscess containing gas inside. MR imaging of brain showed a mass lesion in the left parietal lobe with remarkable perifocal edema. Postgadolinium scan showed significant ring enhancement of the lesion with central non-enhancing

hypointensity. There was contrast-enhancing track from the abscess extending to the overlying scalp wound (Figure 2), which was consistent with the diagnosis of left parietal lobe gas-producing brain abscess. On interrogation, it proved to be the site of habitual obsessive scalp scratching.

The patient was immediately started on intravenous broad antibiotics empirically (vancomycin, metronidazole and ceftriaxone). She underwent emergency left parietal trephine craniotomy (2 x 2 cm) placed over the infective scalp wound. There was defect (or sinus) noted at this site under the flap. The trephine was placed centering over the skull defect. Dura was adherent to overlying bone and to the underlying capsule of the brain abscess. After opening the capsule, 20-30 cc of pus with extreme fetid smell, gushed out with air bubbles from the abscess cavity. After surgery, the trephined bone flap was not placed back because of suspicion of osteomyelitis.

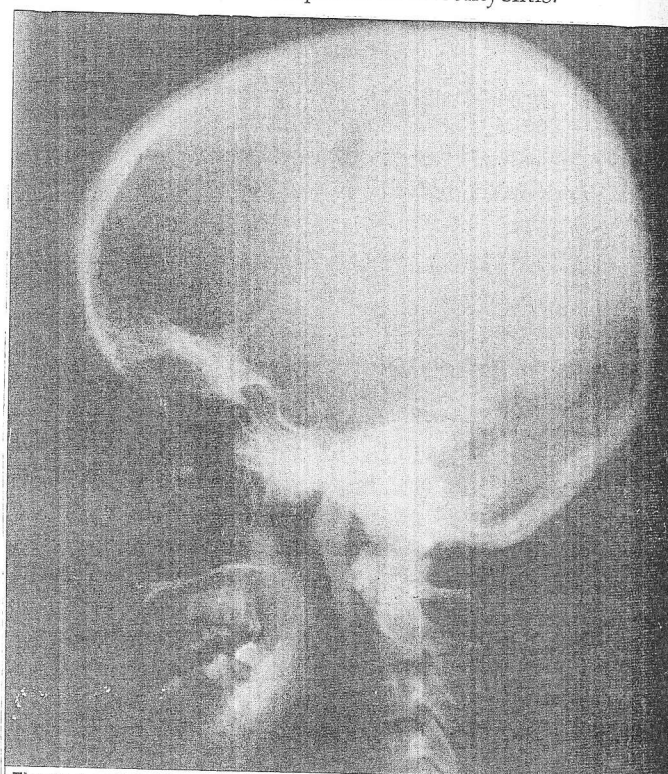


Figure 1: Plain X-ray skull showing an air-bubble with fluid level, inside the cranial cavity.

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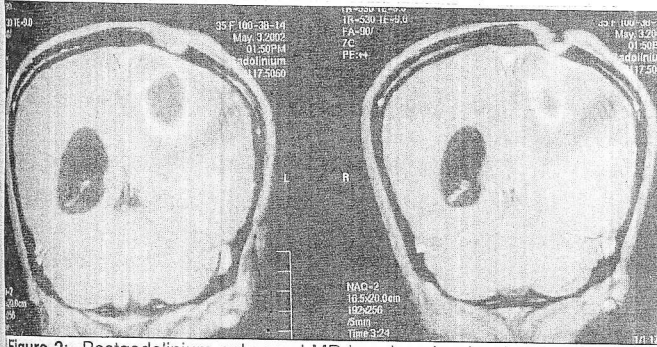


Figure 2: Postgadolinium enhanced MR imaging showing (coronal sections) showing continuity of intracerebral ring-enhancing lesion and a focus in the scalp with a contiguous enhancing track between them.

Gram-staining of pus revealed numerous gram-positive cocci and culture growth was polybacterial, including moderate growth of beta-hemolytic *Streptococci* group B and F, bacteriodes *Asaccharolyticus*, *Peptostreptococcus* species with few colonies of *Staphylococcus aureus*. Similarly, cultures for mycobacterium (including acid-fast bacilli smear) and fungus remain negative.

Postoperatively, the patient deteriorated and repeat CT scan of brain showed residual brain abscess with significantly increased perifocal edema. Patient was re-operated for left parietal craniotomy and complete surgical excision of the abscess (including capsule) was done. Afterwards, patient showed progressive neurological improvement in her conscious level. She was switched to sensitive antibiotics (chloramphenicol, vancomycin and metronidazole for 4 weeks and then continued on oral antibiotics for another 8 weeks). On 6-month follow-up, her lower limb weakness improved to the extent of walking without support. She underwent cranioplasty (with methylmethacrylate) of left parietal bone defect after one year when she was back to her routine.

DISCUSSION

Gas within brain abscess is seen only once in almost 300 cases of brain abscess.^{2,3} Gas containing brain abscess involves an infectious emergency.⁵ This leads to a rapidly progressive clinical deterioration in conscious level and worsening neurological deficits, mimicking an acute and severe meningoccephalitis.^{2,3,5} In our patient trivial scalp wound, which was produced by obsessive scratching, progressively became bone-deep, finally eroding the skull, resulting in chronic osteomyelitis. This chronic suppurative focus subsequently encroached the dura and produced brain abscess in the underlying brain parenchyma. This chronology of pathological process was confirmed by radiological imaging and surgical findings. Plain X-ray skull showing intracranial gas bubble was quite suspicious of brain abscess.⁶ CT scan with contrast confirmed the circumscribed enhancing pattern of diagnostic brain abscess.⁷ In our case, CT scan also revealed a tiny bone defect with peripheral skull erosion, intervening between intraparenchymal abscess and scalp wound. MR imaging clearly defined the extent of abscess with perifocal edema along with mass effect and midline shift.

Specific surgical considerations are required in the management of gas-forming brain abscesses.^{1-4,8} Unlike in non-gaseous brain abscess, which can be managed by tapping or/and aspiration (singly or repeatedly), the gas-producing brain

abscess requires complete excision of abscess cavity in the initial surgical management.⁸ In our case, it became clear when patient deteriorated after simply draining the abscess without excision in the initial management. Later on, the brain abscess had to be excised along with the involved dura and overlying osteomyelitic skull bone.

Gas-forming brain abscess are generally reported to be polymicrobial containing both aerobic and anaerobic flora.^{4,8} *Clostridium* is the commonest organism reported in literature culprit of producing gas within the brain abscess.¹⁻³ However, *Escherichia coli* and *Proteus*, gram-positive cocci such as *Staphylococcus aureus*, *Streptococcus hemolyticus*, *Streptococcus fecalis* and *Peptostreptococcus* also contribute frequently to the intracerebral suppurative process.^{3,9} Culture growth in our case was also polymicrobial and *Streptococcus hemolyticus* group and *Peptostreptococcus* were probably responsible for production of fetid pus.^{3,9} The clinical implication of this poly-microbial involvement dictates to treat these abscesses with empirical broad-spectrum antibiotics especially covering the gram-negative flora from the beginning of management.

Despite the virulent nature of gas-forming brain abscess, the recovery is comparable to a non gas-forming abscess.^{4,8,10} This can be achieved by prompt diagnosis, early start of broad-spectrum antibiotics, surgical debridement and excision of both the abscess and the contiguous focus of infection as shown in this case.

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