



Contents lists available at ScienceDirect

IDCases

journal homepage: www.elsevier.com/locate/idcr

Case Report

An unusual presentation of hemiparesis: Rapidly progressing *Streptococcal pneumoniae* meningitis secondary to acute mastoiditisRyan Mathern^{a,b,*}, Matthew Calestino^{a,b}^a North Florida Regional Medical Center, Gainesville, FL, 32605, United States^b University of Central Florida College of Medicine, Orlando, FL, 32837, United States

ARTICLE INFO

Article history:

Received 20 October 2019

Received in revised form 15 May 2020

Accepted 15 May 2020

Keywords:

Stroke mimic

Meningitis

Mastoiditis

Myringotomy

ABSTRACT

A sixty-three year-old male who arrived to our emergency department with signs and symptoms of an acute left middle cerebral artery cerebrovascular accident. Initial neurovascular imaging failed to demonstrate any abnormalities that explained his symptoms. His neurologic status rapidly deteriorated in conjunction with the development of severe sepsis. The patient required endotracheal intubation and was transferred to our intensive care unit. After an extensive diagnostic work-up, the etiology of his condition was determined to be due to bacterial meningitis originating from acute mastoiditis. Cultures of cerebrospinal fluid and peripheral blood grew *Streptococcus pneumoniae*. The patient improved with intravenous antimicrobials, intravenous dexamethasone and a left sided myringotomy with tympanostomy tube. The patient made a complete neurological recovery following this treatment.

© 2020 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

With the modern advancements in the emergent medical treatment of both ischemic and hemorrhagic stroke, it is critically important to identify opportunities for early intervention. Additionally, it is pertinent to consider alternative diagnoses to ensure that other neurologic conditions presenting with stroke like symptoms are expediently diagnosed and properly managed. Previous studies have identified a number of “stroke mimics” including infection, seizure, delirium and metabolic encephalopathy. These conditions comprise up to 25 percent of cases that present with stroke like symptoms [1–3]. For example, urinary tract infections and pneumonia have been identified as stroke mimics. Conversely, bacterial meningitis has been identified more commonly as a risk factor for the etiology of stroke rather than a stroke mimic itself [4]. Our case represents the importance of considering acute bacterial meningitis in the differential diagnoses for patients presenting with stroke like symptoms. The rapidly progressing nature of our patient’s neurologic decompensation demonstrates the need for early identification and treatment to prevent devastating neurologic sequelae.

Case report

A 63-year-old male with no known past medical history presented to our emergency department with right sided hemiparesis and altered mental status. His NIH stroke scale was 18 and a stroke alert was called at 9:48 am. The patient’s friend who was with him at his last known baseline reported that at approximately 8:30 am, the patient was driving when he became confused and aphasic. Shortly after the initial symptoms, the patient developed right upper and lower extremity hemiparesis. EMS was contacted and he was taken to our ED. The patient underwent a non-contrast CT scan of the brain (NCCT) which was interpreted as negative for acute cerebrovascular disease. Of note, the imaging did show chronic opacification of left mastoid air cells and fluid in mastoid air spaces bilaterally (Fig. 1A) CT angiography of the head and neck were subsequently obtained to confirm the suspicion of a left middle cerebral artery thrombus. The images did not reveal hemodynamically significant findings or flow limiting arterial stenosis. Additionally, a contrast-enhanced perfusion CT of the brain was also negative for acute disease. Tissue plasminogen activator (tPA) ultimately was not given due to lack of a detailed medical history. The differential diagnosis for the patient’s symptoms was expanded to include infectious etiologies such as meningitis and seizure with a subsequent Todd’s paralysis. As the diagnostic work up continued, the patient developed worsening encephalopathy for which he was intubated for airway protection.

Two hours after arrival to the hospital, the patient developed a fever 103 degrees Fahrenheit and his heart rate increased to 120

* Corresponding author at: 6500 W Newberry Rd., Gainesville, FL, 32605, United States.

E-mail address: rmathern26@gmail.com (R. Mathern).

<https://doi.org/10.1016/j.idcr.2020.e00831>

2214-2509/© 2020 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

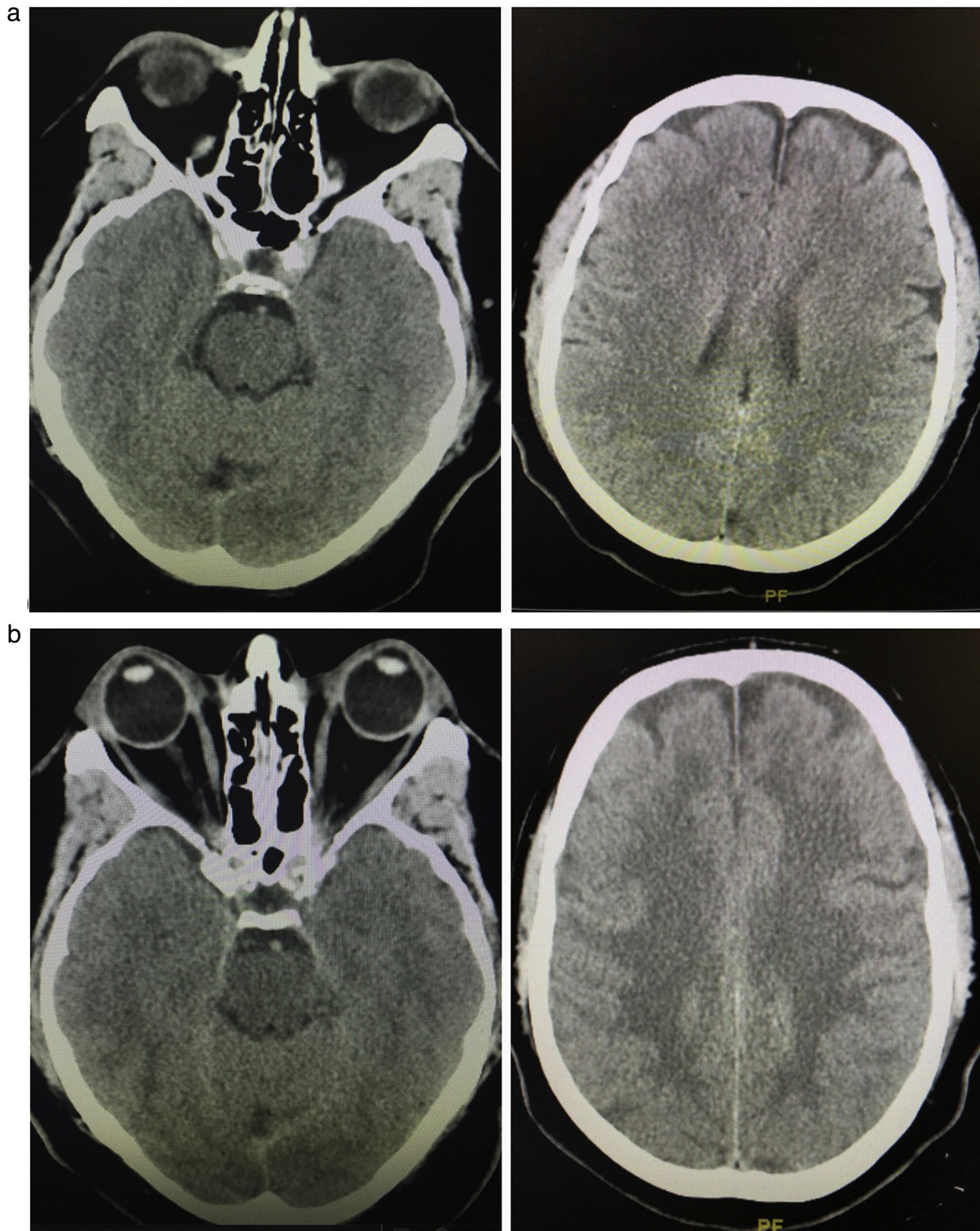


Fig. 1. CT brain on admission (a) and 4 h later with significant increase of swelling (b).

54 beats per minute. On repeat neurologic exam, the patient was
55 found to have a newly dilated, non-reactive right pupil. A central
56 nervous system infection was considered to be the primary source
57 of the patient's neurologic symptoms. Due to the concern for uncal
58 herniation, the patient underwent a stat repeat NCCT scan of the
59 brain. The new images demonstrated rapidly developing white

matter edema, including the pons, with no specific finding to
60 explain the etiology. This rapid, progressive change was markedly
61 abnormal compared to his initial brain CT (Fig. 1B.) The cause of
62 pupillary dilatation was thought to be related to cranial nerve III
63 involvement. A lumbar puncture (LP) was attempted but not
64 completed in the emergency department due to the patient's body
65

Table 1
Cerebrospinal Fluid Studies.

Volume	0.8 mL
Appearance	Hazy
Color	Pink
White Blood Cells	3278 cells
Red Blood Cells	4001 cells
Segmented Neutrophils	90 %
Band Neutrophils	8 %
Lymphocytes	2 %
Glucose	<1
Cryptococcus Antigen	Negative
Herpes DNA I, II PCR	Negative
Toxoplasma IgM, IgG	Negative
CSF West Nile IgM	Negative
CSSF West Nile IgG	Positive
CSF Culture	<i>Streptococcus pneumoniae</i>

habitus. A consult was placed to interventional radiology to perform the LP with fluoroscopic guidance. Cerebrospinal fluid was successfully obtained and sent for analysis. Empiric intravenous vancomycin, ceftriaxone, ampicillin and acyclovir were then administered. Review of the patient's completed blood count was significant for a white blood cell count of at 15,200/ μ L and a lactic acid measurement of 3.2 mmol/L. The patient then met the criteria for severe sepsis. Critical care medicine was consulted and the patient was admitted to the intensive care unit.

The patient remained intubated and sedated in the ICU. The results of his cerebrospinal fluid analysis became available and was significant for 3,278 white blood cells/ μ L, neutrophils 98 %, glucose < 1 mg/dL and total protein of 670 mg/dL (Table 1.) Both blood and CSF cultures grew gram-positive cocci in chains, and later identified as *Streptococcus pneumoniae*. The source of the patient's CNS infection and subsequent neurologic sequelae were suspected to be due to acute on chronic mastoiditis. A consultation was placed to otolaryngology who recommended surgical intervention.

A left sided myringotomy with tympanostomy tube placement was performed to establish drainage of the mastoid air space. Post-operatively, the patient showed signs of improvement as his cranial nerve palsy resolved. Final sensitivities of the blood and CSF cultures were reported on day three of admission. Two grams of ceftriaxone was administered twice a day for eight days of treatment and intravenous dexamethasone was given for a total of four days. A follow up NCCT scan of the brain showed improvement of the previously identified extensive white matter edema.

On day four of admission the patient was weaned off of sedation and was neurologically stable for extubation. His encephalopathy had resolved and his right sided motor weakness had completely resolved. The patient was transferred to the general medical floor for completion of his treatment. He was able to effectively communicate his past medical history which was significant for diabetes mellitus 2 and bilateral mastoidectomies. The procedures were performed approximately one year prior to admission. Relevant to his disease process he reported progressive left ear pain three days prior to his clinical deterioration and subsequent emergent presentation to the ED. Given his history, physical examination findings, diagnostic investigations and neuroimaging, the source of his meningitis was determined to be acute left-sided mastoiditis. At the time of discharge, the patient had a sustained full neurologic recovery.

Discussion

Acute and chronic mastoiditis are predisposing conditions that may lead to acute bacterial meningitis [5]. Despite being a known risk factor for bacterial meningitis, few case reports detailing the association of these diseases and their progression to meningitis

have been published. In 2004, Mustafi et al. investigated cases of acute mastoiditis over a ten-year span. Two of 31 patients went on to develop meningitis as a complication from the condition [6]. While acute mastoiditis commonly presents with retroauricular swelling and inflammation, the percentage of adult patients with these classic physical exam findings is less than 50 % [7]. Our patient did not exhibit these typical findings. However, it is imperative to evaluate for infection via physical exam and CT imaging in patients with a known history of upper respiratory disease. In cases of meningitis secondary to mastoiditis, myringotomy has been shown to be a beneficial adjunct to antimicrobial therapy and should be considered when optimizing the treatment of severe acute cases such as in our patient [8]. Prompt identification and treatment will increase the rate of positive outcomes and limit the potential for permanent neurologic impairment.

The association between stroke and meningitis has been demonstrated through a number of similar cases of bacterial meningitis that presented with stroke like symptoms [9–11]. In 2017, Ertner et al. described a patient that presented with a suspected stroke. The patient's neurological examination was positive for bilateral horizontal nystagmus and suspected right-sided gaze paralysis, raising suspicion for an acute pontine infarct. Similar to our patient, initial CT scans of the brain were negative for stroke. CSF cultures were positive for *S. pneumoniae*, though the cerebrospinal analysis was not indicative of bacterial meningitis [11]. The patient eventually regained normal neurological function with appropriate treatment. Additionally, though uncommon, stroke as a complication of bacterial meningitis has been previously described [4]. Though a variety of potential risk factors have been identified, no definitive direct relationship has been proven [4].

Given the increasing prevalence of stroke like presentations to emergency departments, it is important to have a broad differential of conditions that mimic strokes [1,2]. With the detailed relationship between bacterial meningitis and stroke above, we argue that bacterial meningitis should be included in the differential for these patients with neurologic deficits suggesting stroke. This should be further considered in patients with new onset, or with a known history, of mastoiditis. In doing so, prompt identification and treatment will result in improved outcomes and reduced neurologic sequelae for the otherwise treatable conditions.

Conclusions

Acute bacterial meningitis should be included in the differential diagnosis when considering stroke mimics. The potential for rapid progression of the condition highlights the importance of hourly neurological exams and early intervention to prevent clinical deterioration. Broad-spectrum antimicrobials, steroids and myringotomy with tympanostomy tube placement are effective interventions in treating patients with meningitis secondary to mastoiditis.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Funding

No funding was received.

Data statement

Data is available for review upon request.

Authorship statement

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript.

CRediT authorship contribution statement

Ryan Mathern: Conceptualization, Formal analysis, Writing - original draft, Writing - review & editing. **Matthew Caestino:** Conceptualization, Formal analysis, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare no conflicts of interest.

Acknowledgements

This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication do not represent the official views of HCA Healthcare or any of its affiliated entities.

References

- [1] Dawson A, Cloud GC, Pereira AC, Moynihan BJ. Stroke mimic diagnoses presenting to a hyperacute stroke unit. *Clin Med (Lond)* 2016;16(Oct. (5)):423–6, doi:[http://](http://dx.doi.org/10.1093/ageing/afu099)

- dx.doi.org/10.7861/clinmedicine.16-5-423 PubMed PMID: 27697802; PubMed Central PMCID: PMC6297311.
- [2] Kose A, Inal T, Armagan E, Kiyak R, Demir AB. Conditions that mimic stroke in elderly patients admitted to the emergency department. *J Stroke Cerebrovasc Dis* 2013;22(Nov. (8)):e522–7, doi:<http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2013.05.029> Epub 2013 Jul 4. PubMed PMID: 23830957.
- [3] Gibson LM, Whiteley W. The differential diagnosis of suspected stroke: a systematic review. *J R Coll Physicians Edinb* 2013;43(2):114–8, doi:<http://dx.doi.org/10.4997/JRCPE.2013.205> Review. PubMed PMID: 23734351.
- [4] Bodilsen J, Dalager-Pedersen M, Schönheyder HC, Nielsen H. Stroke in community-acquired bacterial meningitis: a Danish population-based study. *Int J Infect Dis* 2014;20(March)18–22, doi:<http://dx.doi.org/10.1016/j.ijid.2013.12.005> Epub 2014 Jan 14. PubMed PMID: 24433981.
- [5] Kaplan DM, Gluck O, Kraus M, Slovik Y, Juwad H. Acute bacterial meningitis caused by acute otitis media in adults: a series of 12 patients. *Ear Nose Throat J* 2017;96(Jan. (1)):20–8 PubMed PMID: 28122100.
- [6] Mustafa A, Ch Debry, Wiorowski M, Martin E, Gentine A. Treatment of acute mastoiditis: report of 31 cases over a ten year period. *Rev Laryngol Otol Rhinol (Bord)* 2004;125(3):165–9 PubMed PMID: 15602860.
- [7] Palma S, Bovo R, Benatti A, Aimoni C, Rosignoli M, Libanore M, et al. Mastoiditis in adults: a 19-year retrospective study. *Eur Arch Otorhinolaryngol* 2014;271(May (5)):925–31, doi:<http://dx.doi.org/10.1007/s00405-013-2454-8> Epub 2013 Apr 16. PubMed PMID: 23589156.
- [8] Felisati G, Di Bernardino F, Maccari A, Sambataro G. Rapid evolution of acute mastoiditis: three case reports of otogenic meningitis in adults. *Am J Otolaryngol* 2004;25(Nov.–Dec. (6)):442–6, doi:<http://dx.doi.org/10.1016/j.amjoto.2004.06.005> PubMed PMID: 15547816.
- [9] McCann E, Barber M, Hunter P, Inverarity D. A very unusual organism causing stroke-like symptoms. *Age Ageing* 2014;43(Sep. (5)):727–8, doi:<http://dx.doi.org/10.1093/ageing/afu099> Epub 2014 Jul 19. PubMed PMID: 25038834.
- [10] Hsu SS, Kim HS. Meningococcal meningitis presenting as stroke in an afebrile adult. *Ann Emerg Med* 1998;32(Nov. (5)):620–3, doi:[http://dx.doi.org/10.1016/S0196-0644\(98\)70044-7](http://dx.doi.org/10.1016/S0196-0644(98)70044-7) PubMed PMID: 9795329.
- [11] Ertner G, Christensen JR, Brandt CT. Pneumococcal meningitis with normal cerebrospinal biochemistry and no pneumococci at microscopy, mimicking a stroke: a case report. *J Med Case Rep* 2017;11(Jun. (1)):150, doi:<http://dx.doi.org/10.1186/s13256-017-1287-2> PubMed PMID: 28592301; PubMed Central PMCID: PMC5461735.