Meningitis and Endocarditis as a Sequela of Streptococcus Pneumoniae Mastoiditis: A Case Report

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May 16, 2023

Meningitis and Endocarditis as a Sequela of Streptococcus Pneumoniae Mastoiditis: A Case Report

Running Title: Meningitis, Endocarditis, Mastoiditis as a Variant of Austrian Syndrome

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Ethical Statement: The authors of this study had the required consent from the patient involved in this case report.

Data Availability Statement: All data can be found in the article and no other data or materials were used.

Acknowledgements: N/A

Conflicts of Interest: Authors state no conflicts of interest.

Background: *Streptococcus pneumoniae* is responsible for more than 50% of all bacterial meningitis and has a case fatality rate of 22% in adults[1]. In addition, *Streptococcus pneumoniae* is also one of the most common causes of acute otitis media, a known cause of mastoiditis. However, in conjunction with bacteremia and endocarditis, limited evidence is able to be identified[2]. This sequence of infections also closely relates to Austrian syndrome. Otherwise known as Osler's triad, Austrian syndrome is a rare phenomenon of meningitis, endocarditis, and pneumonia secondary to *Streptococcus pneumoniae* bacteriemia that was first delineated by Robert Austrian in 1956[3]. The incidence of Austrian syndrome is reported to be less than <0.0001% per year and has decreased significantly since the initial usage of penicillin in 1941[4]. Despite this, the mortality rate of Austrian syndrome is still around 32%[5]. Despite an extensive literature review, we were unable to find any reported cases of variants of Austrian syndrome that include mastoiditis as the primary

insult. As such, we present a unique presentation of Austrian syndrome with mastoiditis, endocarditis, and meningitis with complex medical management that led to resolution for the patient.

Objective: To discuss the presentation, progression, and complex medical management of a rare triad of mastoiditis, meningitis, and endocarditis occurring in a patient.

Key Clinical Message: Austrian Syndrome classically consists of meningitis, endocarditis, and pneumonia due to *Streptococcus pneumoniae* bacteremia. A literature review, however, does not show variants of this triad. Our case highlights a unique variant of Austrian Syndrome with mastoiditis, meningitis, and endocarditis which requires immediate recognition and treatment to prevent devastating patient outcomes.

Case report: A 78-year-old man with past medical history of resected prostate cancer, pheochromocytoma, and obstructive sleep apnea presented to the emergency department due to altered mental status, right-sided whole-body weakness, and expressive aphasia. The patient's wife reported that the patient was shivering and lethargic and his last known normal was determined to be 14 hours prior to presentation. The patient's recent medical history was remarkable for planned procedure to undergo bilateral eustachian tube placement. The patient developed a fever up to 103 F in the emergency department and initial labs revealed a leukocytosis of 12 with lactic acid of 1.67. Further imaging included CT scan of the head as well as CTA head and neck which did not reveal any acute abnormalities other than a right-sided tympanomastoid effusion FIGURE 1. The physical exam on admission was significant for altered mental status, agitation, and subjective nuchal rigidity. Moreover, the patient was incoherent, a significant decline from his baseline independence according to his wife. The patient received a fluid bolus and Cefepime in the ED prior to hospital admission. An attempt to obtain a lumbar puncture in the ED was also unsuccessful due to the patient's increased agitation. Upon admittance to the hospital, Vancomycin and Ceftriaxone at central nervous system dosing were administered to the patient for empiric coverage of meningitis. Furthermore, blood cultures were positive for *Streptococcus pneumoniae* . On hospital day 2, another attempt at lumbar puncture under fluoroscopy was attempted but was unsuccessful due to repeated patient agitation. Lumbar puncture was finally obtained on hospital day 3 under sedation with the following CSF findings consistent with bacterial meningitis: FIGURE 2

CSF cultures showed no growth and ENT was consulted for further evaluation of right tympanomastoid effusion secondary to mastoiditis. Patient underwent right mastoidectomy with bilateral myringotomy with ear tube insertion on hospital day 3. The mastoid bone was noted to be sclerotic and the mastoid air cells were filled with inflammatory tissue. Vancomycin was also discontinued on hospital day 4 after cultures revealed sensitivity to Ceftriaxone.

Further workup included a transthoracic echocardiogram which revealed an immobile mitral valve echodensity measuring 0.7 cm in diameter associated with chordal structures of the anterior mitral leaflet without evidence of mitral regurgitation or mitral stenosis FIGURE 3. This strongly suggested endocarditis and infectious diseases and cardiology were consulted and determined transesophageal echocardiogram was not required to confirm the diagnosis. As such, the decision was made to extend the patient's ceftriaxone for 6 weeks for treatment of endocarditis. However, the patient developed significant surgical site bleeding on hospital day 6 which was presumed to be due to ceftriaxone-induced thrombocytopenia, so ceftriaxone was stopped, and Vancomycin was restarted. The patient also had elevated fibrinogen suggesting possible disseminated intravascular coagulation so a dose of cryoprecipitate was given, and the patient's platelet and fibrinogen levels stabilized after hospital day 9. The patient had deconditioned significantly from his baseline status so physical therapy was initiated and the patient responded very well. On hospital day 10, a peripherally inserted central catheter line was placed so that the patient could continue to receive IV antibiotics at home. The patient was stable for home discharge on hospital day 11.

Discussion/Conclusion:

Austrian's syndrome has been typically described as meningitis, endocarditis, and pneumonia with multiple case reports and case series describing the difficulties of managing this complex disease. There is, however, no published cases that demonstrate a variant of Austrian syndrome with the triad of mastoiditis, endocarditis, and meningitis. In this patient's case, the tympanomastoid effusion may have been the initial insult that led

to mastoiditis. Moreover, meningitis has been described in several cases as a rather uncommon complication of mastoiditis[6,7]. Furthermore, the etiology of the patient's endocarditis was likely due to meningitis[8], but there are some case reports that suggest that mastoiditis may also directly cause endocarditis[9]. Our patient initially presented with altered mental status with multiple failed attempts at a lumbar puncture due to agitation, so we initiated empiric coverage of meningitis with vancomycin and ceftriaxone[10]. Notably, we did not add ampicillin because our clinical suspicion of*Listeria monocytogenes* was extremely low. Initial CT scans revealed a right tympanomastoid effusion which we believed was the nidus of infection. Prompt ENT intervention surgically removed the right mastoid bone to alleviate the probable bacterial source, but our patient unfortunately developed post-operative DIC which is a known complication of both meningitis and head/neck surgery[11,12]. Ceftriaxone was stopped due to incidences of ceftriaxone-induced thrombocytopenia and cryoprecipitate was given with resolution of the patient's uncontrolled bleeding. Our patient endured several complications due to his complex interaction of diseases, but we were able to treat him effectively. As such, this case report presents an exceptionally distinct variant of a rare phenomenon in Austrian syndrome with complex medical management that resulted in complete recovery of the patient.

Author Contributions:

Author 1: Dr. Mitchell Peebles provided direct medical care to the patient, helped write the initial manuscript, and reviewed/edited the final draft before submission.

Author 2: Dr. Mehnaz Roshani supervised the patient's medical care and reviewed/edited the final draft before submission.

Author 3: Kumaraman Srivastava helped write the initial manuscript, reviewed/edited the final draft before submission, and also served as the corresponding author.

The authors of this study obtained written consent from the patient prior to submission of this case report.

Key Words: *Streptococcus pneumoniae* , Austrian syndrome, mastoiditis, meningitis, endocarditis

References:

1. Clinical features of pneumococcal disease. Centers for Disease Control and Prevention. January 27, 2022. Accessed May 10, 2023.*https://www.cdc.gov/pneumococcal/clinicians/clinical-features.html.*

2. Gregory J, Chohrach N, Iyengar D (August 29, 2022) Invasive Pneumococcal Disease Secondary to Acute Otitis Media in a High-Risk Patient: A Case Report and Review of Recent Changes to Pneumococcal Immunization Guidelines. Cureus 14(8): e28557. doi:10.7759/cureus.28557

3. Shin YI, Papyan N, Cedeño H, Stratidis J. Austrian syndrome: The deadly triad. IDCases. 2020;22:e00948. doi: 10.1016/j.idcr.2020.e00948. Epub 2020 Sep 4. PMID: 32923368; PMCID: PMC7473259.

4. Rodríguez Nogué M, Gómez Arraiz I, Ara Martín G, Fraj Valle MM, Gómez Peligros A. Austrian syndrome: A rare manifestation of invasive pneumococcal disease. Case presentation and literature review. Rev Esp Quimioter. 2019 Apr;32(2):98-113. Spanish. Epub 2019 Mar 15. PMID: 30880376; PMCID: PMC6441982.

5. Akram A, Kazi A, Haseeb A. The Deathly Hallows of the Austrian Triad. Cureus. 2020 Jan 5;12(1):e6568. doi: 10.7759/cureus.6568. PMID: 32047709; PMCID: PMC6999727.

6. Barry C, Rahmani G, Bergin D. Pneumocephalus and Meningitis as Complications of Mastoiditis. Case Rep Radiol. 2019 Feb 19;2019:7876494. doi: 10.1155/2019/7876494. PMID: 30915252; PMCID: PMC6399545.

7. Felisati G, Di Berardino F, Maccari A, Sambataro G. Rapid evolution of acute mastoiditis: three case reports of otogenic meningitis in adults. Am J Otolaryngol. 2004 Nov-Dec;25(6):442-6. doi: 10.1016/j.amjoto.2004.06.005. PMID: 15547816.

8. Lucas MJ, Brouwer MC, van der Ende A, van de Beek D. Endocarditis in adults with bacterial meningitis. Circulation. 2013 May 21;127(20):2056-62. doi: 10.1161/CIRCULATIONAHA.113.001545. Epub 2013 Apr

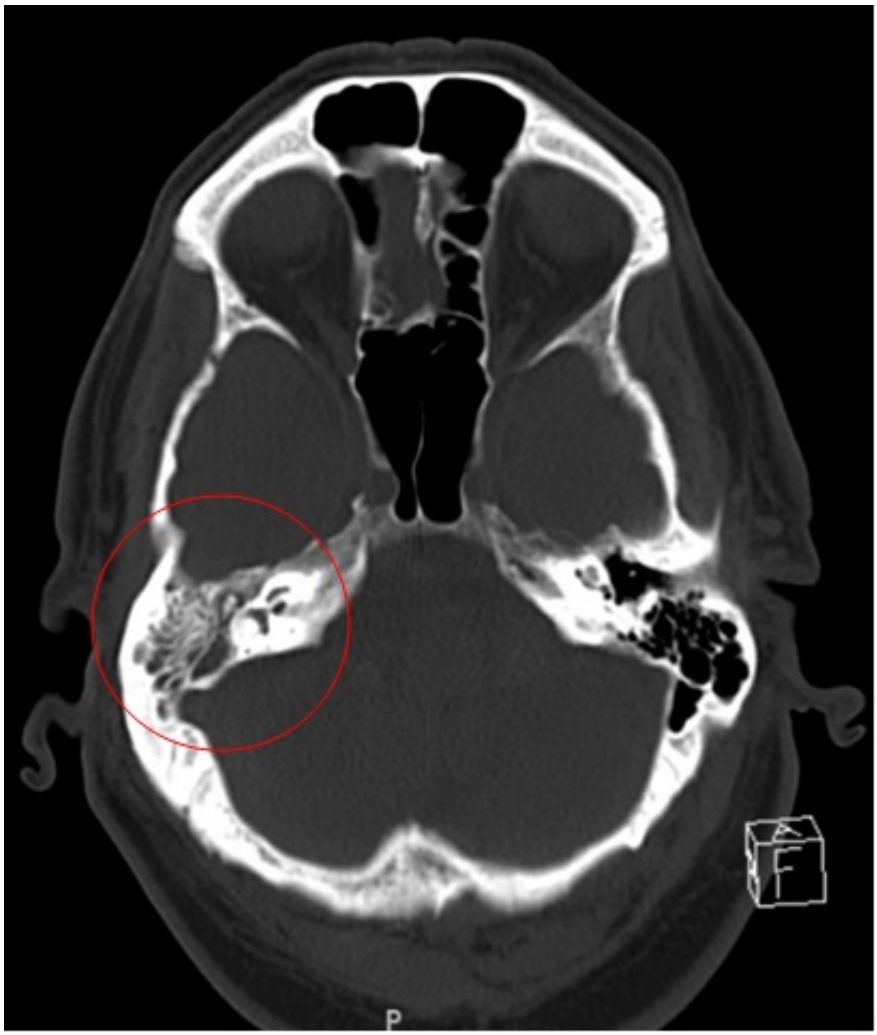
17. PMID: 23596007.

9. Smith CP, Jackson C, Stewart R. Subacute bacterial endocarditis secondary to mastoiditis: a rare complication. BMJ Case Rep. 2012 Nov 30;2012:bcr2012007247. doi: 10.1136/bcr-2012-007247. PMID: 23203179; PMCID: PMC4543826.

10. Tunkel AR, Hartman BJ, Kaplan SL, Kaufman BA, Roos KL, Scheld WM, Whitley RJ. Practice guidelines for the management of bacterial meningitis. Clin Infect Dis. 2004 Nov 1;39(9):1267-84. doi: 10.1086/425368. Epub 2004 Oct 6. PMID: 15494903.

11. Ozaki H, Tachibana H, Ishikawa S, Yusa K, Kitabatake K, Iino M. Disseminated Intravascular Coagulation after Surgery for Facial Injury. Case Rep Dent. 2016;2016:6053652. doi: 10.1155/2016/6053652. Epub 2016 May 30. PMID: 27313913; PMCID: PMC4904073.

12. Mertens R, Peschgens T, Granzen B, Heimann G. Diagnosis and stage-related treatment of disseminated intravascular coagulation in meningococcal infections. Klin Padiatr. 1999 Mar-Apr;211(2):65-9. doi: 10.1055/s-2008-1043767. PMID: 10407813.



	Latest Reference Range & Units	
Tube Number, CSF		1 3
Total Volume, CSF	mL mL	1.9 3.0
Color, CSF	Colorless Colorless	Light Yellow ! Light Yellow !
Clarity, CSF	Clear Clear	Cloudy ! Cloudy !
Color after centrifugation, CSF		Colorless Colorless
RBC, CSF	<=0 RBC/uL <=0 RBC/uL	6,569 (H) 1,173 (H)
WBC, CSF	0 - 5 WBC/uL 0 - 5 WBC/uL	38,473 (H) 18,197 (H)
Neutrophil, CSF	0 - 6 % 0 - 6 %	87 (H) 86 (H)
Lymphocyte, CSF	40 - 80 % 40 - 80 %	0 (L) 0 (L)
Monocyte, CSF	15 - 45 % 15 - 45 %	13 (L) 13 (L)
Eosinophil, CSF	%	1
Protein, CSF	15.0 - 40.0 mg/dL	260.8 (H)
Glucose, CSF	40 - 70 mg/dL	13 (L)