



# Management of a patient with acute internal hydrocephalus, ventriculitis and bronchopneumonia.

## Case report

**Balasa Daniel, MD, PhD; Tunas Alexandru, MD**

Department of Neurosurgery, Clinical County Hospital, Constanta, ROMANIA

### ABSTRACT

A 69-year-old patient, with a long history of lung tuberculosis, with lymphopenia was emergently admitted in our hospital for bronchopneumonia, ventriculitis, acute internal hydrocephalic. He was aggressively treated with iv Meropenem and Vancomycin, intraventricular high doses of Vancomycin, aerosols, Dexametazone with healing of internal hydrocephalus, ventriculitis and improvement of bronchopneumonia.

### OBJECT

The international data in the literature regarding the treatment of ventriculitis is limited. The authors aimed to share their experience in the treatment of ventriculitis and using intraventricular (IVT) and intravenous antibiotherapy.

### CASE REPORT

The patient was a 69 year-old man, with a previous history of lung tuberculosis. He was adressed to the emergency department for 2 days of fever (39 degrees C), 4 days of productive cough with purulent expectoration, dyspnea with tachypnea, respiratory failure (SPO2 87%), altered mental status (stupor, GCS 10 ), neck stiffness. The patient was treated by his family doctor with oral cefuroxyme , 4 grams daily . The patient was imunodepressed (lymphocytes 470/microliter)

Chest X-rays and CT scan revealed bronchopneumonia (Fig. 1)

Head CT Scann: Acute hidrocephalus, ventriculitis, parafluid purulent deposits in occipital horns, bilateral. (Fig 2 - blue arrows)

The lumbar puncture revealed a purulent CSF with 4690 white cells/mm<sup>3</sup>, 92% of neutrophils.

The patient underwent emergency surgery, extraventricular drainage (EVD) with double purpose: treatment of acute hydrocephalus and treatment of ventriculitis. The ventricular CSF samples were purulent. For this reason we considered unnecessary a

### Keywords

bronchopneumonia,  
 intraventricular vancomycin,  
 limphopenia,  
 ventriculitis



Corresponding author:  
**Balasa Daniel**

University of Medicine and  
 Pharmacy "Carol Davila",  
 Bucharest, Romania

[balasadaniel100@yahoo.com](mailto:balasadaniel100@yahoo.com)

**Copyright and usage.** This is an Open Access article, distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is unaltered and is properly cited.

The written permission of the Romanian Society of Neurosurgery must be obtained for commercial re-use or in order to create a derivative work.

ISSN online 2344-4959  
 © Romanian Society of  
 Neurosurgery



First published  
 March 2020 by  
 London Academic Publishing  
[www.lapub.co.uk](http://www.lapub.co.uk)

complementary head MRI scan. Bacteriologic examination of the CSF revealed: *Streptococcus pneumoniae*. Intravenous antibiotherapy with Meropenem 6 grams/day and Vancomycin 2 grams/day, intraventricular antibiotics (Vancomycin 50 mg/day in the first postoperative day and 100 mg/day in the following days), iv Dexametasone (6 mg q 6 hours), aerosols with salbutamol 5mg/ml, 1 ml. After 22 days of treatment, control CT Scann revealed disappearance of the acute hydrocephalus and the occipital purulent debris (Fig 3).



**Figure 1.** Bronchopneumonia. Multiple perihilar opacities, bilateral.

**Figure 2.**



**Figure 3.** Postoperative contrast CT Scann. No internal hydrocephalus, no ventriculitis. Moderate ventriculomegaly.

The neurological status of the patient progressively improved and the neck stiffness dissappeared, also the respiratory status improved.

Follow time period: 5 months

#### DISCUSSION

Ventriculitis is defined by high fever, clinical signs of meningitis (nuchal rigidity, photophobia, decreased mental status, seizures), a positive CSF culture, positive Gram stain, decreased CSF glucose, increased CSF proteins, CSF pleocytosis (at least 11 leukocytosis/mL with 50% or more polymorphonuclear neutrophils)<sup>1,2</sup> In the pre-antibiotic era, the great majority of patients died from bacterial meningitis/ventriculitis at the end of the first week of ventriculitis<sup>3</sup>. Nowadays, the incidence of this complication lowered. Central nervous system infections requiring treatment with intraventricular (IVT) vancomycin are becoming increasingly common with advent of intracranial devices and increasing prevalence of multi-drug resistant and nosocomial organisms<sup>4</sup>. Administering vancomycin via IVT route bypasses the blood-brain barrier and allows controlled delivery directly to the desired site of action, achieving higher concentrations for a more reliable bactericidal action<sup>4</sup>. Indications for IVT vancomycin include meningitis unresponsive to intravenous antibiotics, ventriculitis, and intracranial device infections<sup>4</sup>. Recommended dosages of antimicrobial agents

administered by the intraventricular route are vancomycin (5–20 mg/d). Dosages reported in literature ranged from 0.075–50 mg/day, with the most evidence for dosages of 5 to 20 mg/day. Duration of therapy most commonly ranged from 7 to 21 days<sup>4</sup>. For this patient, considering the immunodepression, bronchopneumonia, ventriculitis our option was to administer a higher dose of IVT Vancomycin. The patient received additional dexamethasone according to current guidelines, as soon as possible when the lumbar puncture reveals a purulent CSF<sup>6</sup>. Such a treatment has been proven to be beneficial in preventing hearing loss and neurological sequelae in adult purulent bacterial meningitis, particularly those due to *Streptococcus pneumoniae*<sup>6,7</sup>.

The mean time to obtain CSF sterilisation in medical literature was 24 hours. This time was achieved in this case too. The fever disappeared in the first postoperative day.

There were no adverse effects of antibiotics administered IVT.

## CONCLUSION

Intraventricular and intravenous antibiotics lead very quickly to CSF sterilisation in this critical ill patient.

THE IVT vancomycin administration appears to be safe and have high efficacy together with IV administration of Vancomycin and Meropenem.

The IVT Vancomycin dose, higher than the literature data, dramatically hastened the healing of ventriculitis and shortened the hospitalisation period of the patient.

## FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

## CONFLICTS OF INTEREST

There are no conflicts of interest

## REFERENCES

1. Sundbarg G, Kjallquest A, Lundberg N, et al. Complications due to prolonged ventricular fluid pressure recording in clinical practice. In: Brock M, Dietz H, eds. *Intracranial Pressure I: Experimental and Clinical Aspects—International Symposium on Intracranial Pressure*, Hannover, 1972. Berlin: Springer-Verlag;348–35, 1972.
2. Sundbarg G, Nordstrom CH, Soderstrom S. Complications due to prolonged ventricular fluid pressure recording. *Br J Neurosurg*;2:485–495, 1988.
3. Adams RD, Kubik CS, Bonner FJ. The clinical and pathological aspects of influenza meningitis. *Arch Pediatr*;65:354–76, 1948.
4. Ng K, Mabasa VH, Ensom MH. Systematic review of efficacy, pharmacokinetics, and administration of intraventricular vancomycin in adults. *Neurocrit Care*. Feb;20(1):158–71, 2014.
5. Bijlsma MW, Brouwer MC, Kasanmoentalib ES, Kloek AT, Lucas MJ, Tanck MW, et al. Community-acquired bacterial meningitis in adults in the Netherlands, 2006–14: a prospective cohort study. *Lancet Infect Dis*. 2016;16:339–447.
6. Brouwer MC, McIntyre P, Prasad K, van de Beek D. In: van de Beek D, editor. *Corticosteroids for acute bacterial meningitis: Cochrane Database Syst. Rev*;2015. <https://doi.org/10.1002/14651858.CD004405.pub5>.
7. Tunkel AR, Hartman BJ, Kaplan SL, Kaufman BA, Roos KL, Scheld WM, et al. Practice guidelines for the Management of Bacterial Meningitis. *Clin Infect Dis*;39(9):1267–84, 2004.
8. W Pfisterer, M Mühlbauer, T Czech, A Reinprecht Early diagnosis of external ventricular drainage infection: results of a prospective study. *J Neurol Neurosurg Psychiatry*;74:929–932, 2003.
9. Ricard JD, Wolff M, Lacherade JC, Mourvillier B, Hidri N, Barnaud G, et al. Levels of vancomycin in cerebrospinal fluid of adult patients receiving adjunctive corticosteroids to treat pneumococcal meningitis: A prospective multicenter observational study. *Clin Infect Dis*;44:250–5, 2007.
10. Nagl M, Neher C, Hager J, Pfausler B, Schmutzhard E, Allerberger F. Bactericidal activity of vancomycin in cerebrospinal fluid. *Antimicrob Agents Chemother*;43:1932–4, 1999.
11. Rybak MJ, Lomaestro BM, Rotschafer JC, Moellering RC, Craig WA, Billeter M, et al. Vancomycin therapeutic guidelines: A summary of consensus recommendations from the infectious diseases society of America, the American Society of Health-System Pharmacists, and the Society of Infectious Diseases Pharmacists. *Clin Infect Dis*;49:325–7, 2009.
12. Wen DY, Bottini AG, Hall WA, Haines SJ. Infections in neurologic surgery. The intraventricular use of antibiotics. *Neurosurg Clin N Am*;3:343–54, 1992.
13. Fukui MB, Williams RL, Mudigonda S. CT and MR imaging features of pyogenic ventriculitis. *AJNR Am J Neuroradiol*. 22(8):1510–6, 2001.