

EARLY EXTRAVENTRICULAR DRAINAGE TO IMPROVING FUNCTIONAL OUTCOME ON ACUTE VIRAL OTOGENIC MENINGOENCEPHALITIS ACCOMPANIED WITH HYDROCEPHALUS IN YOUNG ADULT: RARE COMPLICATION OF OTITIS MEDIA- A CASE REPORT

Egiel Navadz Akthar Alami^{1*}, Eko Aprilianto Handoko², Kamilka Taufiq³, Arsyizilma Hakiim⁴, Putri Fortuna Sari⁵

Faculty of Medicine, University of Jember, Indonesia^{1,5}, Neurology Departement RSUD dr. H. Koesnadi, Bondowoso, East Java, Indonesia^{2,3}, Public Health Department, Faculty of Medicine, University of Jember, Indonesia⁴

*Corresponding Author : egielnavadz@gmail.com

ABSTRAK

Salah satu kemungkinan komplikasi meningoensefalitis adalah hidrosefalus. Drainase ekstrasventrikular secara dini membantu meningkatkan luaran klinis pasien dan dapat digunakan untuk mengevaluasi cairan serebrospinal berulang dan mengendalikan tekanan intrakranial. Seorang laki laki muda berusia 24 tahun datang ke unit gawat darurat dengan keluhan nyeri kepala yang memberat sejak 2 hari lalu. Keluhan disertai dengan leher kaku dan demam sejak 4 hari lalu. Pasien memiliki riwayat sakit telinga kiri sejak 1 minggu lalu. Pasien juga sulit fokus ketika diajak berkomunikasi dan gelisah. Pemeriksaan fisik menunjukkan tekanan darah 139/80 mmHg, nadi 91x/menit, suhu 39,5°C, dan saturasi oksigen (SpO₂) 97%. Status lokalis auricula sinistra terdapat pus berwarna kuning jernih disertai nyeri tarik tragus. Pemeriksaan neurologis menunjukkan GCS 335, tanda meningeal (+), VAS 8-9. Pemeriksaan laboratorium awal menunjukkan Leukosit 21.610 sel/uL; Monosit 2.060 sel/uL; neutrofil 17.390 sel/uL, gula darah acak 193 mg/dL, HIV (-), dan DNA MTB (-). Pemeriksaan CT Scan Kepala dengan kontras menunjukkan kesan encephalitis/meningoencephalitis dengan komplikasi hydrocephalus comunicans. Pasien didiagnosis dengan meningoensefalitis dengan hydrocephalus dan direncanakan Extraventricular Drainage (<24 jam) serta pemeriksaan LCS. Dari hasil pemeriksaan LCS didapatkan warna jernih, Nonne apelt (+), dan pandy (+). Pasien diberikan terapi steroid, antivirus, antibitoik spektrum luas, analgesik, dan antipsikosis. Pasien menunjukkan perbaikan kondisi klinis setelah 6 hari perawatan. Kasus ini relatif jarang, terutama pada komplikasi otitis media yang menyebabkan meningoensefalitis dan hidrosefalus komunikans pada pasien dewasa muda. EVD dini dan pengobatan spesifik tampaknya meningkatkan luaran klinis.

Kata kunci : drainase ekstrasventrikular, hydrocephalus otogenik, meningoencephalitis, virus

ABSTRACT

One of possible complication from meningencephalitis is hydrocephalus. Early extraventricular drainage help to improving patient's clinical outcome and usable to evaluating liquor cerebrospinal repeatedly and controlling intracranial pressure. The complaint was accompanied by neck stiffness and fever for the preceding 4 days. Local examination of the left auricle showed the presence of clear yellowish pus with tragal tenderness. Neurological examination demonstrated a Glasgow Coma Scale (GCS) score of 3-3-5, positive meningeal signs, and a Visual Analogue Scale (VAS) pain score of 8-9. Initial laboratory findings revealed leukocyte count of 21,610/ μ L; monocytes 2,060/ μ L; neutrophils 17,390/ μ L; random blood glucose 193 mg/dL; HIV (-); and MTB DNA (-). A contrast-enhanced head CT scan suggested encephalitis/meningoencephalitis with communicating hydrocephalus. The patient was diagnosed with meningoencephalitis with hydrocephalus and was scheduled for extraventricular drainage (within <24 hours) along with cerebrospinal fluid (CSF) analysis. CSF examination revealed a clear appearance, Nonne-Apelt (+), and Pandy (+). The patient was treated with corticosteroids, antiviral, broad-spectrum antibiotics, analgesics, and antipsychotics. Clinical improvement was observed after six days of hospitalization.

Keywords : extraventricular drainage, meningoencephalitis, otogenic hydrocephalus, viral

INTRODUCTION

Otogenic meningoencephalitis is a rare but serious intracranial complication where an infection of the ear, such as otitis media, spreads to the brain's meninges and brain tissue (Moral, et. al., 2025). Middle ear pathology, including acute otitis media and chronic suppurative otitis media with or without cholesteatoma, has been associated with intracranial sequelae in approximately 0.4–6.4% of reported cases (Hafidh et al., 2006). Among these complications, meningitis is the most frequently encountered, accounting for 35–46.4% of cases. While establishing the diagnosis of meningitis and identifying its otogenic origin is often straightforward, detecting underlying bony defects can be diagnostically challenging (Dubey et al., 2010). Several mechanisms have been proposed for intracranial extension of otogenic infections, including direct anatomical continuity between the inner ear and meninges, hematogenous dissemination, septic thrombophlebitis, and erosion of the temporal bone structures such as the tegmen tympani (Patel et al., 2014).

Otitic hydrocephalus, although rare, remains a recognized complication of middle ear disease. Historically, it has been linked to venous sinus thrombosis and secondary intracranial hypertension. More recent clinical series and reviews continue to emphasize meningitis and hydrocephalus as major otogenic intracranial complications that require multidisciplinary management, typically involving otolaryngology, infectious disease, and neurosurgical teams (Gurung et al., 2011; Sadoghi & Payman, 2007). Extraventricular drainage (EVD) is one of option management for otitic hydrocephalus rapidly lowering intracranial pressure (ICP), improving cerebral perfusion, and allowing frequent CSF sampling and analysis. Early EVD is promising to improve clinical outcome on meningoencephalitis accompanied hydrocephalus, in this case, we present a strategic management early EVD to improving functional outcome on acute viral otogenic meningoencephalitis accompanied with hydrocephalus in young adult.

CASE REPORT

Table 1. Initial Laboratory Examination

Table 1: Blood Laboratory Examination					
Parameter		Laboratory values		Unit	Normal values
Hb		12,6		g/dL	12-16
HCT		35,7		%	37-54
MCV		75,2		fL	80-100
MCH		26,5		Pg	27-34
MCHC		35,3		g/dl	32-36
Leukosit					
White blood cells		21.610		/uL	4.000-10.000
Limfosit		2110		/uL	1000-3700
Monosit		2060		/uL	0-700
Eosinofil		0		/uL	0-400
Basofil		50		/uL	0-100
Neutrofil		17390		/uL	1500-7000
Platelet					
Trombosit		307000		/uL	150000-450000
Blood Glucose					
Random Glucose	Blood	193		Mg/dl	<150
Renal Function					
BUN		16		Mg/dl	6-20
Creatinin		0.7		Mg/dl	0.9-1.3

A 24-year-old male presented to the emergency department with worsening headache for the past 2 days. The complaint was accompanied by neck stiffness and fever for the past 4 days.

The patient also had a history of left ear pain for 1 week. He experienced difficulty focusing during communication and appeared restless. Physical examination showed blood pressure 139/80 mmHg, pulse 91 bpm, temperature 39.5°C, and oxygen saturation (SpO₂) 97%. Local examination of the left auricle revealed clear yellowish pus with tragus tenderness. Neurological examination showed GCS 3-3-5, positive meningeal signs, facial palsy sinistra UMN type, and VAS 8–9. Initial laboratory findings revealed leukocytes 21,610 cells/ μ L; monocytes 2,060 cells/ μ L; neutrophils 17,390 cells/ μ L; random blood glucose 193 mg/dL; HIV (-); and MTB DNA (-). Head CT scan with contrast suggested encephalitis/meningoencephalitis with communicating hydrocephalus. Intensive treatment for this case involves collaboration between neurologist, neurosurgeon, and otolaryngologist. The patient was diagnosed with meningoencephalitis with hydrocephalus and planned for extraventricular drainage (EVD) and cerebrospinal fluid (CSF) examination on the second day of treatment.

CSF analysis showed clear appearance, Nonne-Apelt (+), and Pandy (+). This result indicating viral infection. The patient was given steroid therapy, antiviral, broad-spectrum antibiotics, analgesics, and antipsychotics. After sixth day of hospitalization, clinical improvement was observed after EVD, with GCS increasing to 4-5-6, and reduction in headache intensity and fever.



Figure 1. Chest X-Ray Examination Showed Normal Condition

Table 2. Liquor Cerebrospinal Analysis

Parameter	Laboratory values	Unit	Normal values
Macroskopis			
Color	Colorless	-	Colorless
Clarity	Clare	-	
Clot	Negative	-	Negative
Mickroskopis			
Leukosit count	310	cell/uL	
PMN	65	%	
MN	35	%	
Glucose	54	Mg/dL	0-100
Total Protein	0.04	g/dL	1.0-2.0
Nonne Apelt	Positif (+1)		Negative
Pandy	Positif (+1)		Negative

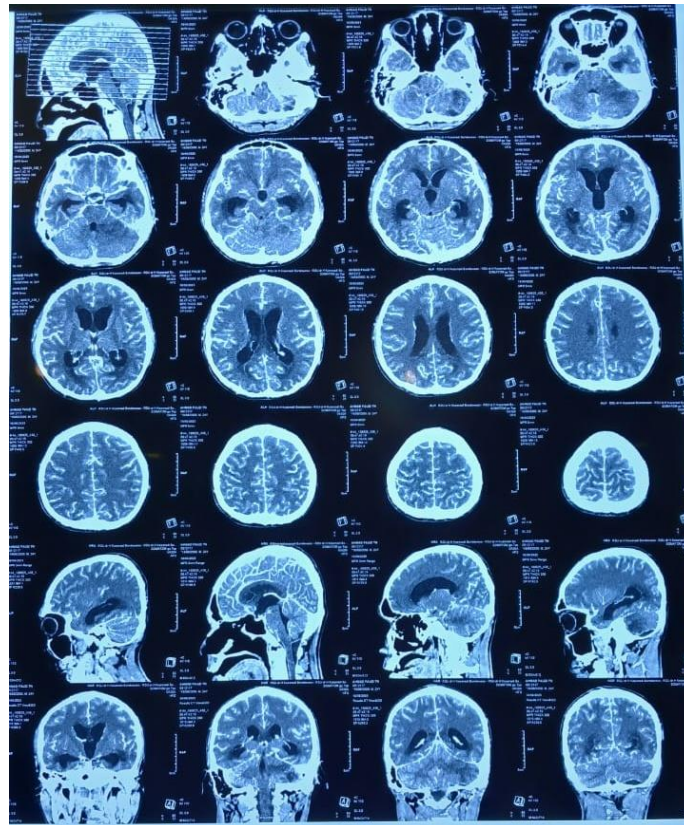


Figure 2. Head CT Scan With Contrast Suggested Encephalitis/Meningoencephalitis With Communicating Hydrocephalus

DISCUSSION

Middle-ear infections can extend intracranially via venous spreading, bony disruption, or direct spread through the temporal bone, leading to complications such as meningitis, cerebritis/encephalitis, lateral/sigmoid sinus thrombosis, brain abscess, and more rarely otitic hydrocephalus (Osborn, et. al., 2011). In meningoencephalitis, communicating hydrocephalus commonly arises from impaired CSF resorption at arachnoid granulations due to inflammatory exudates. In this case, acute meningoencephalitis accompanied with communicating hydrocephalus acquired after patient presenting middle ear infections from a week recently (Rajshekhar & Vetandam, 2011). Otogenic meningoencephalitis are commonly bacterial, viral CNS infections can occasionally trigger acute hydrocephalus through intense leptomeningeal inflammation and transient CSF flow obstruction/resorption failure (Heppner, et. al., 2008; Nitta, et. al., 2025; Sandeep & Mukesh, 2021). From other study reporting HSV and other viral etiologies precipitating acute hydrocephalus that required CSF diversion. This supports the biological plausibility that a viral otogenic meningoencephalitis in the setting of concurrent otitis media can present with communicating hydrocephalus demanding urgent pressure control.

EVD is widely regarded as a life-saving in acute hydrocephalus across indications, rapidly lowering intracranial pressure (ICP), improving cerebral perfusion, and allowing frequent CSF sampling and analysis (Bertuccio, et. al., 2023). In meningitis, observational series show that a subset with hydrocephalus undergo EVD during the acute phase, and expert guidance emphasizes aggressive ICP management when clinical or radiologic signs of intracranial hypertension are present (Tariq, et. al., 2017) Direct comparative data on “early” versus “delayed” EVD for infectious hydrocephalus in adults are scarce. However, across neuro-

critical scenarios (e.g., severe TBI; post-hemorrhagic hydrocephalus in infants), earlier CSF diversion correlates with faster ICP control and may be associated with better neurodevelopmental/cognitive outcomes acknowledging different pathologies and low-quality evidence (Chau, et. al., 2020; Haim Bassan, et. al., 2012).

For cases of meningitis/meningoencephalitis with hydrocephalus, although there are no standard guidelines, the use of "early EVD" (≤ 24 hours after diagnosis + signs of decreased GCS or imaging ventriculomegaly) can be used as a practical guideline based on effective time patterns from studies in other fields. Translating this rationale to infectious communicating hydrocephalus, early EVD initiated at the onset of decompensation or radiologic ventriculomegaly with clinical decline can plausibly shorten the duration of critical ICP elevations, reduce secondary injury from global hypoperfusion, and facilitate optimized, targeted therapy via serial CSF studies (Ohbuchi, et. al., 2021). In our case, prompt EVD coincided with rapid improvement in consciousness and symptom burden, aligning with these physiologic benefits.

For young adults with acute otitis media and rapidly progressive neuroinfectious syndromes, clinicians should maintain a high index of suspicion for intracranial complications. When imaging confirms ventriculomegaly with clinical deterioration, early EVD is a reasonable strategy to stabilize ICP and potentially improve functional outcomes while carefully managing etiology (Beruccio, et. al., 2023; Ebel, et. al., 2023; Kuo-Wei Wang, et. al., 2005). In this case, patient given corticosteroid, antiviral, broad spectrum antibiotic to treat otogenic infection, and antipsychotic to treat this patient. Patient showing good clinical improvement after sixth day therapy and experiencing early EVD.

CONCLUSION

This case is relatively rare, especially in complications of otitis media which causes meningoencephalitis and communicating hydrocephalus in young adult patients. Early EVD. and specific treatment appeared to improve clinical outcome. Early detection is an important key to providing appropriate treatment to patients. Another research is needed to explore various diagnostic approaches based on novel technology for improving diagnosis accuracy.

ACKNOWLEDGEMENT

The authors would like to thank Dr. H. Koesnadi Regional General Hospital of Bondowoso Regency and Medical Faculty of Jember University for the publication of this manuscript.

REFERENCES

- Bertuccio, A., Marasco, S., Longhitano, Y., Romenskaya, T., Elia, A., Mezzini, G., Vitali, M., Zanza, C., & Barbanera, A. (2023). *External Ventricular Drainage: A Practical Guide for Neuro-Anesthesiologists*. *Clinics and practice*, 13(1), 219–229. <https://doi.org/10.3390/clinpract13010020>
- Chau, C. Y. C., Mediratta, S., McKie, M. A., Gregson, B., Tulu, S., Ercole, A., Solla, D. J. F., Paiva, W. S., Hutchinson, P. J., & Kolias, A. G. (2020). *Optimal Timing of External Ventricular Drainage after Severe Traumatic Brain Injury: A Systematic Review*. *Journal of Clinical Medicine*, 9(6), 1996. <https://doi.org/10.3390/jcm9061996>
- Dubey SP, Larawin V, Molumi CP. *Intracranial spread of chronic middle ear suppuration*. *Am J Otolaryngol* 2010; 31:73–7.

- Ebel, F., Lichter, E., Mariani, L., Guzman, R., & Soleman, J. (2023). *Rapid Versus Gradual Weaning of External Ventricular Drain: A Systematic Literature Review and Meta-analysis*. *Neurocritical care*, 39(1), 250–259. <https://doi.org/10.1007/s12028-023-01766-6>
- Gurung, Urmila; Anurag, 1; Ullah, K S2; Shrivastav, R P; Bhattarai, H. *Otitic hydrocephalus*. *Indian Journal of Otology* 17(4):p 167-169, Oct–Dec 2011. | DOI: 10.4103/0971-7749.94497
- Hafidh MA, Keogh I, Walsh RM, et al. *Otogenic intracranial complications. A 7-year retrospective review*. *Am J Otolaryngol* 2006; 27:390–5
- Haim Bassan, Rina Eshel, Inbal Golan, David Kohelet, Liat Ben Sira, Dror Mandel, Loren Levi, Shlomi Constantini, Liana Beni-Adani, *Timing of external ventricular drainage and neurodevelopmental outcome in preterm infants with posthemorrhagic hydrocephalus*, *European Journal of Paediatric Neurology*, Volume 16, Issue 6, 2012, Pages 662-670, ISSN 1090-3798, <https://doi.org/10.1016/j.ejpn.2012.04.002>.
- Heppner, P. A., Schweder, P. M., Monteith, S. J., & Law, A. J. (2008). *Acute hydrocephalus secondary to herpes simplex type II meningitis*. *Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia*, 15(10), 1157–1159. <https://doi.org/10.1016/j.jocn.2007.07.001>
- Kuo-Wei Wang, Wen-Neng Chang, Hsueh-Wen Chang, Hung-Chen Wang, Cheng-Hsien Lu, *Clinical relevance of hydrocephalus in bacterial meningitis in adults*, *Surgical Neurology*, Volume 64, Issue 1, 2005, Pages 61-65, ISSN 0090-3019, <https://doi.org/10.1016/j.surneu.2004.10.009>.
- Mahmood Sadoghi, Payman Dabirmoghaddam, *Otitic hydrocephalus: case report and literature review*, *American Journal of Otolaryngology*, Volume 28, Issue 3, 2007, Pages 187-190, ISSN 0196-0709, <https://doi.org/10.1016/j.amjoto.2006.07.007>.
- Moral, M., Blanco, C., & Lorenzo, V. (2025). *Otogenic Meningitis or Meningoencephalitis in 30 Dogs: Association Between Neurological Signs, Magnetic Resonance Imaging Findings, and Outcome*. *Veterinary Sciences*, 12(5), 456. <https://doi.org/10.3390/vetsci12050456>
- Ohbuchi, H., Hagiwara, S., Arai, N., Yoneyama, T., Takahashi, Y., Inazuka, M., Kubota, Y., Chernov, M., & Kasuya, H. (2021). *Optimal timing and safety of the external ventricular drainage in patients with high-grade aneurysmal subarachnoid hemorrhage treated with endovascular coiling*. *Journal of clinical neuroscience : official journal of the Neurosurgical Society of Australasia*, 88, 63–69. <https://doi.org/10.1016/j.jocn.2021.03.003>
- Osborn, Alexander J.^a; Blaser, Susan^b; Papsin, Blake C.^a. *Decisions regarding intracranial complications from acute mastoiditis in children*. *Current Opinion in Otolaryngology & Head and Neck Surgery* 19(6):p 478-485, December 2011. | DOI: 10.1097/MOO.0b013e32834b0d92
- Patel KM, Almutairi A, Mafee MF. *Acute otomastoiditis and its complications: role of imaging*. *Operative Techniques in Otolaryngology* 2014; 25:21–8.
- Rajshekhar, Vedantam. *Management of hydrocephalus in patients with tuberculous meningitis*. *Neurology India* 57(4):p 368-374, Jul–Aug 2009. | DOI: 10.4103/0028-3886.55572
- Sandeep Bhardwaj, Mukesh Vij, *Acute hydrocephalus: An atypical and rare presentation of herpes simplex viral encephalitis in adolescents*, *Interdisciplinary Neurosurgery*, Volume 24, 2021, 101015, ISSN 2214-7519, <https://doi.org/10.1016/j.inat.2020.101015>.
- Tariq, A., Aguilar-Salinas, P., Hanel, R. A., Naval, N., & Chmayssani, M. (2017). *The role of ICP monitoring in meningitis*. *Neurosurgical Focus FOC*, 43(5), E7. <https://doi.org/10.3171/2017.8.FOCUS17419>