Trauma Case Reports 42 (2022) 100707

Contents lists available at ScienceDirect

Trauma Case Reports

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

Case Report

A rare case of posttraumatic meningitis presenting with acute hydrocephalus

M. Petrov [a,*], J. Samuel [b], I. Jordanova [a], P. Ilkov [a], N. Velinov [a], N. Gabrovsky [a]

[a] Department of Neurosurgery, University Multiprofile Hospital for Active Treatment with Emergency Medicine N. I. Pirogov, Sofia, Bulgaria
[b] Department of Neurology, University Multiprofile Hospital for Active Treatment with Emergency Medicine N. I. Pirogov, Sofia, Bulgaria

ARTICLE INFO

Keywords:
Posttraumatic meningitis
Acute hydrocephalus after mild TBI
Posttraumatic hydrocephalus

ABSTRACT

Posttraumatic meningitis is a severe complication of traumatic brain injury (TBI) that dramatically increases its mortality. Skull-base fractures increase the risk of posttraumatic meningitis. Posttraumatic hydrocephalus was encountered in 0.7 %–29 % of the patients with severe head injury. Posttraumatic hydrocephalus should be differentiated from ventriculomegaly due to brain atrophy.

We present a clinical case of a 52-year-old patient after a mild TBI and a linear skull base fracture who developed acute hydrocephalus in the context of a posttraumatic meningitis within the first week after the injury. The occurrence of hydrocephalus in patients with posttraumatic meningitis is not well studied but could lead to rapid deterioration of the patient. It results from injury-induced disturbance of CSF flow either through obstruction or lack of CSF reabsorption. Factors increasing the risk of posttraumatic meningitis are - operative interventions, skull base fractures and CSF leakage. Patients with meningitis usually present with lower GCS score. The lower GCS is a harbinger of worse prognosis. Therefore, aggressive medical treatment is warranted.

With this case study we show that meningitis presenting with PTH can develop rapidly over 24 h within the first week post mild head injury with basilar skull fracture. A swift response in providing timely ventricular drainage, together with an appropriate antimicrobial coverage, can greatly reduce any lasting neurological deficits and produce a good clinical outcome.

Introduction

Posttraumatic meningitis is a severe complication of traumatic brain injury (TBI) that dramatically increases its mortality [3]. Skull-base fractures increase the risk of posttraumatic meningitis. Posttraumatic hydrocephalus was encountered in 0.7 %–29 % of the patients with severe head injury [2]. Posttraumatic hydrocephalus should be differentiated from ventriculomegaly due to brain atrophy. We report a clinical case of posttraumatic meningitis presenting with acute hydrocephalus.

* Corresponding author at: University Multiprofile Hospital for Active Treatment with Emergency Medicine N. I. Pirogov, 21 Totleben Blvd., Sofia, Bulgaria.
E-mail address: mihail5rov@gmail.com (M. Petrov).

https://doi.org/10.1016/j.tcr.2022.100707
Accepted 2 October 2022
Available online 4 October 2022

Case report

A 52-year-old male patient was admitted after a fall with loss of consciousness. The patient has vomited a couple of times before arriving to the hospital. On admission the patient is GCS 15pts., neurologically intact with mild headache. A CT (computed tomography) scan was performed and is shown in Fig. 1. A small epidural hematoma was noted at the pole of the temporal lobe and mild pneumocephalus as an indicator for the linear fracture of the skull base. The patient was admitted for observation for a couple of days. During the stay at the Department of Neurosurgery the patient was neurologically intact, with no signs of liquorrhea and with only a mild headache. On the 5th day after control CT scan (Fig. 2) with no enlargement in the diameter of the epidural hematoma and complete resolution of the pneumocephalus the patient was discharged home with instructions and mild analgesics. The patient was scheduled for a check-up in two weeks. Twenty-four hours later the patient was brought with an ambulance to the Emergency department. The patient was GCS 8pts, reactive pupils, nuchal rigidity was present and bradycardia of around 35–40 beats/min. In Fig. 3 is shown the emergency CT scan that was conducted. A marked hydrocephalus is noted compared to the previous imaging study 24 h earlier. According to the relatives of the patient he was with fever for the last 24 h with temperature of 38 °C. Due to the dramatic neurological decline and the imaging study a decision was taken to place an external ventricular drainage. During the procedure CSF was taken for microbiological and cytological examination. The laboratory results were as follows:

- RBC – 0 M/L
- WBC – 1322 M/L
- PMN – 74 %
- Total protein – 2.5 g/L
- Glucose – 0.52 mmol/L.

The microbiological results came back a few days later – positive for Streptococcus Alpha-haemolyticus. Only after 24 h from the placement of the EVD the patient gradually improved to GCS 15pts and no neurological deficit, except from neck stiffness, interpreted as meningoradicular irritation. A 7-day course with Linezolide was prescribed until two sterile CSF specimens were obtained from the EVD. The patient was gradually weaned off the EVD. On the 8th day the EVD was closed and after 48 h a control CT scan was performed. In Fig. 4 is shown that there were no signs of hydrocephalus and the EVD was removed, and the patient discharged one day later. On discharge neuropsychological test were performed with the following results – Standardised Mini-Mental State Examination (SMMSE) 21 out of 30pts, Trail Making Test (TMTA) - slightly more time needed but not deficient, TMT-B deficient with numerous errors, Symbol Digit Modalities Test (SDMT) – 33 points. At the 1st month follow-up visit the patient had no complaints and was neurologically intact. The neuropsychological tests showed steady improvement.

Discussion

Skull base fractures, comprising 7 % to 15.8 % of all skull fractures, are associated with an increased risk of meningitis due to the possible direct contact of bacteria in the paranasal sinuses, nasopharynx or middle ear with the central nervous system (CNS). Cerebrospinal fluid (CSF) leakage has been associated with a greater risk of contracting meningitis [1]; however, no CSF leak was

Fig. 1. Axial reconstructions of CT scan of the patient during admission to the Department of Neurosurgery. A small epidural hematoma (red arrow) is present in the temporopolar region on the right (A). Pneumocephalus (white arrow) and a small air bubble are present in the right frontal horn of the lateral ventricle (B).

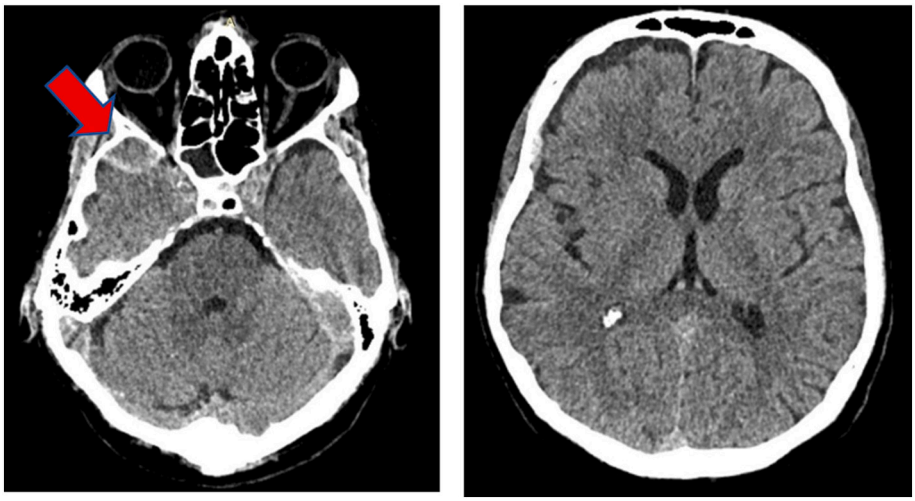

Fig. 2. Control CT scan on the 5th day after the trauma. The epidural hematoma (red arrow) has not enlarged in diameter.

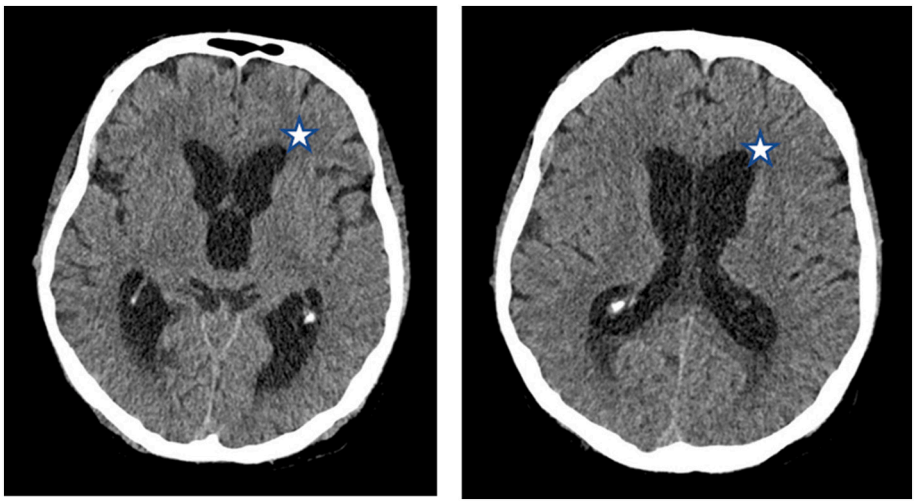

Fig. 3. A control CT scan 24 h after the patient was discharged and was brought back to the hospital. The ventricular system, marked with a white asterisk, has significantly enlarged.

observed in our patient. Prophylactic antibiotics in patients with this type of injury have not been shown to be beneficial in preventing meningitis however this is currently still under debate [7,8]. Posttraumatic meningitis is a possible complication of severe TBI. In a large Japanese study of more than 60,000 people only 0.5 % of patients had posttraumatic meningitis [3]. Factors increasing the risk of posttraumatic meningitis are - operative interventions, skull base fractures and CSF leakage. Patients with meningitis usually present with lower GCS score. The lower GCS is a harbinger of worse prognosis. Therefore, aggressive medical treatment is warranted [4].

Acute hydrocephalus refers to the rapid enlargement of the ventricular system. Hydrocephalus is rare in community-acquired meningitis – only around 5 % of cases, and its presence predicts poorer prognosis [5]. The pneumocephalus in mild traumatic brain injury is usually self-limited and leads to no consequences. There are reports of perimesencephalic pneumocephalus as the cause of acute hydrocephalus [6]. Post-traumatic hydrocephalus (PTH) is a common finding radiologically with an incidence between 30 and 86 % when using the CT criteria for ventriculomegaly [9]. However, in our case the skull base fracture led to meningitis that in turn presented with acute hydrocephalus. The occurrence of hydrocephalus in patients with posttraumatic meningitis is not well studied but could lead to rapid deterioration of the patient. It results from injury-induced disturbance of CSF flow either through obstruction or lack of CSF reabsorption [10]. In a series of 136 patient with community-acquired spontaneous bacterial meningitis only 21 % had hydrocephalus and in all cases, it was a communicating hydrocephalus and in only 7 cases an external ventricular drainage was needed. The mortality rate of the patients with hydrocephalus and meningitis that were treated with EVD was 42.8 % [10]. Reduced CSF absorption in the arachnoid villi or failure in the circulation of CSF in the basal cisterns could be the reason for hydrocephalus in post-traumatic and spontaneous bacterial meningitis patients [9,10].

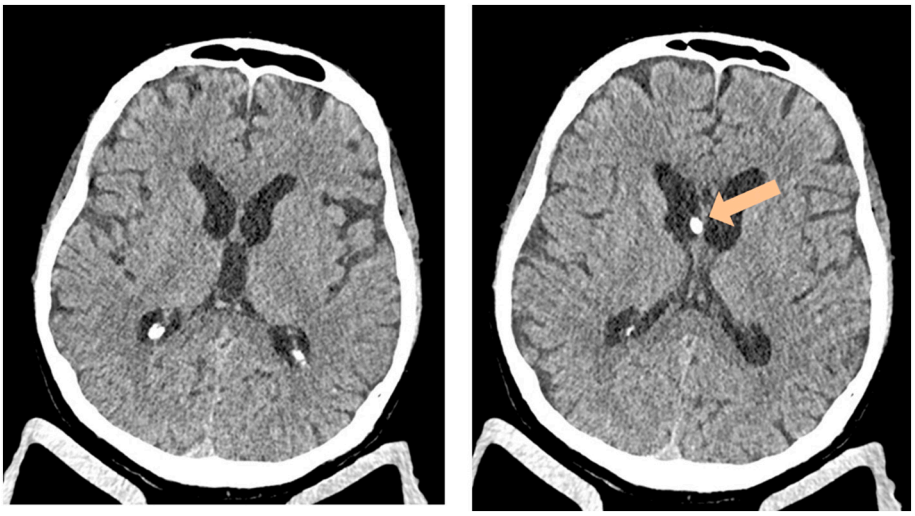

Fig. 4. CT scan of the patient after 10 days with EVD. The CT scan is performed after 48 h with the EVD closed. The EVD is shown on the Fig. with yellow arrow.

Our patient had a rapid deterioration in GCS score within the first week post injury, accompanied by fever. His dynamic clinical picture prompted a swift repeat of the CT scan, resulting in the diagnosis and treatment of his hydrocephalus and meningitis. Had his clinical picture been more static or if his head injury was more severe with a lower initial GCS score a PTH might have been missed or diagnosed too late when placement of EVD or a VP shunt would not have improved his neurological score.

With this case study we show that meningitis presenting with PTH can develop rapidly over 24 h within the first week post mild head injury with basilar skull fracture. A swift response in providing timely ventricular drainage, together with an appropriate antimicrobial coverage, can greatly reduce any lasting neurological deficits and produce a good clinical outcome.

References

[1] I. Baltas, S. Tsoulfa, P. Sakellariou, V. Vogas, M. Fylaktakis, A. Kondodimou, Posttraumatic meningitis: bacteriology, hydrocephalus, and outcome, Neurosurgery 35 (3) (1994) 422–427, https://doi.org/10.1227/00006123-199409000-00009.

[2] E.R. Cardoso, S. Galbraith, Posttraumatic hydrocephalus–a retrospective review, Surg. Neurol. 23 (3) (1985) 261–264, https://doi.org/10.1016/0090-3019(85)90092-8.

[3] Y. Katayama, T. Kitamura, K. Kiyohara, et al., Factors associated with posttraumatic meningitis among traumatic head injury patients: a nationwide study in Japan, Eur. J. Trauma Emerg. Surg. 47 (1) (2021) 251–259, https://doi.org/10.1007/s00068-019-01224-z.

[4] M.J. Lucas, M.C. Brouwer, A. van der Ende, D. van de Beek, Outcome in patients with bacterial meningitis presenting with a minimal Glasgow coma scale score, Neurol. Neuroimmunol. Neuroinflamm. 1 (1) (2014) e9, https://doi.org/10.1212/NXI.0000000000000009. Published 2014 May 15.

[5] E.S. Kasanmoentalib, M.C. Brouwer, A. van der Ende, D. van de Beek, Hydrocephalus in adults with community-acquired bacterial meningitis, Neurology 75 (10) (2010) 918–923, https://doi.org/10.1212/WNL.0b013e3181f11e10.

[6] Guichen Li, Guangming Wang, Tengfei Luan, Kun Hou, Jinlu Yu, Acute hydrocephalus secondary to traumatic perimesencephalic pneumocephalus, Medicine 99 (5) (January 2020) e18654, https://doi.org/10.1097/MD.0000000000018654.

[7] B.O. Ratilal, J. Costa, L. Pappamikail, C. Sampaio, Antibiotic prophylaxis for preventing meningitis in patients with basilar skull fractures, Cochrane Database Syst. Rev. (4) (2015), CD004884, https://doi.org/10.1002/14651858.CD004884.pub4. Published 2015 Apr 28.

[8] Richard Kuehl, Andrea Büchler, Andreas F. Widmer, Manuel Battegay, Digging out the evidence—how strong is the IDSA recommendation against antibiotic prophylaxis in basilar skull fracture and cerebrospinal fluid leakage? Clin. Infect. Dis. 66 (8) (15 April 2018).

[9] J.E. Yoon, C.Y. Lee, E.G. Sin, J. Song, H.W. Kim, Clinical feature and outcomes of secondary hydrocephalus caused by head trauma, Korean J. Neurotrauma 14 (2) (2018) 86–92, https://doi.org/10.13004/kjnt.2018.14.2.86.

[10] K.W. Wang, W.N. Chang, H.W. Chang, H.C. Wang, C.H. Lu, Clinical relevance of hydrocephalus in bacterial meningitis in adults, Surg. Neurol. 64 (1) (2005) 61–66, https://doi.org/10.1016/j.surneu.2004.10.009.