Enterobacter cloacae ventriculitis successfully treated with cerebrospinal system irrigation and intraventricular colistin, preliminary report

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Abstract

Ventriculitis is difficult to treat and can lead to serious sequelae, a long course of treatment and hospitalization. We report a case of enterobacter cloacae ventriculitis and progressive hydrocephalus successfully treated by neuroendoscopic intraventricular irrigation followed by ventricular and subarachnoid space (cerebrospinal system) irrigation with Ringer's lactate solution.
Despite surgical intervention has not been established as a first-choice treatment for ventriculitis, neuroendoscopic surgery followed cerebrospinal system irrigation and intraventricular colistin, appears effective for the management of ventriculitis and hydrocephalus.
The strategy described in this report might be useful to lifesaving procedure and to reduce the overall duration of hospitalization.

KEY WORDS: colistin, enterobacter cloacae, hydrocephalus, intraventricular lavage, meningitis, ventriculitis.

Introduction

Meningitis still represent a serious problem in spite of advanced treatment methods. It causes several life-threatening complications such as ventriculitis, ependymitis, focal encephalitis, hydrocephalus, porencephaly, multicystic encephalopathy, epilepsy, mental retardation and so on.
Enterobacter species, specially Enterobacter cloacae and Enterobacter aerogenes, are important nosocomial pathogens responsible for various infections. They are resistant to aminopenicillins, cefazolin and cefoxitin due to the production of beta-lactamases; carbapenems are considered the drug of choice in these cases.
Risk factors for nosocomial Enterobacter infections comprise hospitalization of more than 2 weeks, invasive procedures in the past 72 hours, treatment with antibiotics in the past 30 days and the presence of a central venous catheter (1).
Intraventricular colistin has been used successfully to treat multidrug-resistant Enterobacter cloacae ventriculitis (2).
In intractable meningitis, the only antibiotic treatment, also intrathecal, may not be sufficient. Based on previous clinical and experimental studies (3-5), we hypothesized that drainage of purulent cerebrospinal fluid (CSF), followed by ventricular and subarachnoid space (cerebrospinal system) irrigation with Ringer's lactate solution, could be a success in the treatment of complicated meningitis. We describe a case of post-neurosurgical ventriculitis caused by Enterobacter cloacae, successfully treated with cerebrospinal system irrigation and intraventricular colistin.

Case report

We report a case of a 29 years old man recovered in our hospital ICU on October 2011.
He was victim of a road traffic accident, motorbike collided with a car, impact with no helmet.
He reported severe polytrauma: thoracic trauma with pulmonary contusions, brain injury with right fronto-temporal-parietal epidural-subdural hematomas and right tibia, fibula, clavicle fractures.
He was in coma, GCS=4. Right decompressive craniectomy was performed, was mechanically ventilated for 20 days, than extubated.
During ICU stay, his conditions improved and at the moment of discharge in a rehabilitation centre he had recovered full consciousness with post traumatic amnesia, left hemiplegia persisted, hemodynamic conditions were stable, blood tests values were in normal range.
After 20 days of rehabilitation centre stay, his conditions worsened. He became stuporous, fever developed (38,5 °C), dyspnoea occurred, blood white cells count was 20000/ml, procalcitonin 5ng/7ml.
He was recovered in our hospital ICU again. Empirical antibiotic therapy with cefepime 2g every 8 hours was started.
A contrast computed tomography (TC) scan performed in the same day revealed the presence of acute hydrocephalus (Figure 1).

Figure 1 - Contrast CT of the brain demonstrates hydrocephalus, hyperdense layering material in the occipital horns of the lateral ventricles and thin regular enhancement of the ependymal lining of the ventricles.

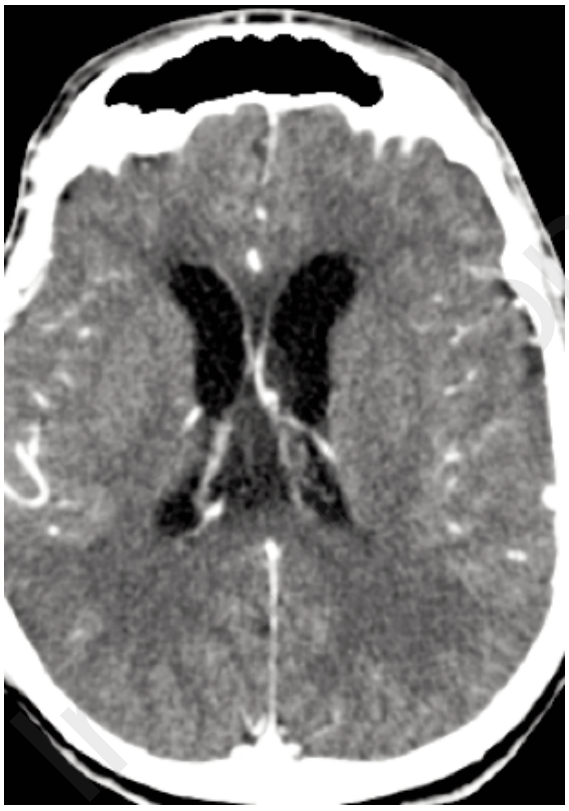

Figure 2 - Contrast CT of the brain after 1 week, demonstrates absence of hyperdense layering material and enhancement of the ependymal lining of the ventricles.

We performed CSF drainage of both lateral ventricles urgently. The fluid drained from both ventricles was just like pus. Extensive ventricular irrigation using commercially available Ringer's lactate solution, was attempted under neuroendoscopy (30° Decq Storz endoscope) of both lateral ventricles. Floating materials were sufficiently washed out.
For successive irrigation, a 2.7 mm diameter catheter (Codman Medos Ventricular Catheter) was inserted into the right ventricle and a 1.65 mm catheter (Codman Lumbar External Drainage Catheter) was placed in the subarachnoid space at the lumbar 4-5 level.
CSF sample was obtained in the operating room.
The irrigation was repeated 2 times a day for one week.
CSF white cells count was 5.5000/ml, CSF culture was performed and repeated every day. A sample of secretions obtained from the craniectomy wound was taken for culture examination.
MDR, ESBL+ Enterobacter cloacae grew in multiple CSF and wound secretions samples. It was susceptible only to colistin (MIC≤0.5).
Therapy was changed and Meropenem (2g every 8 h) i.v. and intrathecal colistin (100000 U.I. every 24 hours) between the irrigations was started.
Tracheostomy was performed (Grigg's technique).
After 1 week of therapy patient's conditions began to improve. Fever disappeared, blood and CSF tests return in normal range, CSF cultures became negative. Intraventricular catheter was removed and the patient discharged in our neurosurgery department.
A computed tomography (TC) scan performed in the same day, revealed the absence of hyperdense layering material and enhancement of the ependymal lining of the ventricles (Figure 2).
Our subarachnoid irrigation was able to drain pus and inflammatory products in the ventricles before the formation of septations. In fact, the patient recovered without the need for CSF shunt. We emphasize that subarachnoid irrigation in combination with intathecal antibiotic therapy, is able to bring about good results for patients with severe ventriculitis.

Discussion

Meningitis is termed as a meningocerebral inflammatory response to purulent material collection in the ventricular and subarachnoid spaces (CSF system). Meningitis results in cerebral ischemia, infarction, oedema, cerebritis, abscess, hemorrhage, hydrocephalus and occasionally brain herniations.
Bacterial meningitis commonly leads to death or serious neurological sequelae, including communicating hydrocephalus. Acute inflammation of the meninges,

vascular involvement, meningeal adhesions were the histopathological hallmarks of meningitis.

Purulent CSF facilitates local bacterial growth and behaves as a bacterial reservoir. Meningitis is often lead by ventriculitis and the CSF has a pus-like appearance. Early drainage of CSF and intrathecal antibiotic therapy may produce a better outcome for meningitis. In intractable meningitis cases, a ventricular drainage-irrigation system may permit an adequate perfusion of the CSF together with an antibiotic to the subarachnoid space.

Continuous intraventricular irrigation in ventriculitis cases was reported in previous experimental and clinical studies (3-5).

Significant reduction occurs in CSF formation in ventriculitis due to inflammation of the choroid plexuses. Inflammation of the arteries and veins of the choroid plexuses may also lead to a decrease in CSF production, which in turn contribute to the occlusion of vessels and CSF circulation (3, 6).

Therefore, CSF replacement may prevent complications developing as a consequence of depleted CSF. Schmidt et al. (7), have shown that despite a reduction of CSF bacterial titer and leucocyte counts by CSF filtration, the extent of neuronal damage was unaltered in experimental streptococcal meningitis. Only antibiotic therapy, also intrathecal, could not be completely sufficient for the meningitis.

We suggest that neuroendoscopic ventricular irrigation with Ringer's lactate solution, followed by twice daily ventricular irrigation together with spinal drainage until obtaining clear CSF, not only remove foreign materials in the CSF, but also prevent disturbances seen in cerebral circulation due to vasculo-occlusive factors observed in meningitis. Ringer's lactate solution is preferred over normal saline because its composition is more like CSF (8).

Reduced CSF may cause subarachnoid space restricting, arachnoid-pia mater and vascular wall adhesions and arachnoid villus occlusions may result in circulation disorders both in blood and CSF circulation. Therefore, ventricular irrigation and CSF replacement procedure may inhibit brain herniations by reducing the risk of hydrocephalus development and brain oedema, and other complications related to meningitis.

The findings of this study support the beneficial effects of the use of cerebrospinal fluid system irrigation in the treatment of meningitis, together with intrathecal antibiotic therapy.

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