

Cerebrospinal Fluid Leakage (Liquorrhea) Management in Heads Traumas

Zabsonre Denlewende Sylvain^{1,*}, Yameogo Pacome¹, Ouiminga Habib Abdoul Karim², Sanou Abdoulaye¹, Zida Ilyasse¹, Thiombiano Abdoulaye¹, Lankoande Henri¹, Kinda Boureima¹, Kabre Abel¹

¹Neurosurgery Department of Yalgado Ouedraogo Teaching Hospital, Joseph Ki-Zerbo University, Ouagadougou, Burkina Faso

²Orthopedic, Traumatology and Neurosurgery Department of Tengandogo Teaching Hospital, Ouagadougou, Burkina Faso

Email address:

szabsonre@gmail.com (Z. D. Sylvain), pacomesergey@yahoo.fr (Y. Pacome), ouimkar@gmail.com (O. H. A. Karim),

sanou_abdou2002@yahoo.fr (S. Abdoulaye), zidilias@yahoo.fr (Z. Ilyassé), th_abdoulaye@yahoo.fr (T. Abdoulaye),

lankoandehenri1983@gmail.com (L. Henri), kindab2@yahoo.fr (K. Boureima), kabrel@yahoo.fr (K. Abel)

*Corresponding author

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Abstract: *Introduction.* Liquorrhea is a leakage of cerebrospinal fluid (CSF) into an air cavity of the skull base through an osteomeingeal breach which can exit through nos and / or ear. Highlighting the breach and closing it is sometimes very difficult. The aim of this work was to study cerebrospinal fluid liquorrhea management in our work environment. *Method.* This was a retrospective study over 05 years (2010-2014). We included any cases of liquorrhea managed in the neurosurgery department of Yalgado Ouédraaogo teaching hospital in Ouagadougou. *Results.* Thirty-five cases were included, they were 34 male and 1 female. The average age was 31.6 years. Liquorrhea was the reason for admission in 11 cases. Physical examination found rhinorrhea in 24 cases, otorrhea in 9 cases and oto-rhinorrhea in 2 cases. A fracture line was objectified one CT scan in all patients. This fracture line could explain the liquorrhea in 24 cases. Conservative treatment was performed in 33 cases. Two patients were operated. Outcome was favorable in 33 patients. One patient died of meningitis. *Conclusion.* Highlighting of the breach was difficult in our work context where CT-scan can provide good orientations. Treatment was essentially conservative; prognosis very often favorable except in the event of a complication such as meningitis.

Keywords: Rhinorrhea, Otorrhea, Head Trauma

1. Introduction

Liquorrhea is a flow of cerebrospinal fluid (CSF) into an air cavity of the skull base through an osteomeingeal breach which may exit through the nose and / or the ear. When it occurs in traumatic context, it evokes fracture of skull base. This leakage of CSF may go unnoticed or manifest clinically as signs of intracranial hypotension [1-3]. The diagnosis is therefore sometimes very difficult because it is based on the one hand on the identification of the CSF and on the other hand on the identification of the breach through which this CSF leaks, hence the capital place of medical imaging in this diagnosis [4, 5]. This LCS leak exposes patients to fatal

complications such as severe purulent meningitis, brain abscesses, intra cranial empyemas [6, 7]. Treatment of this breach is also difficult and knows several modalities [8]. The aim of this work was to study the management of post-traumatic liquorrhea in our department.

2. Method

This was a retrospective, descriptive and analytical study over run 05 years from January 1, 2010 to December 31, 2014. We included any cases of liquorrhea (otorrhea and / or rhinorrhea) managed in the neurosurgery department of Yalgado Ouédraaogo teaching hospital in Ouagadougou. All

theses cases performed at least a cranio-encephalic CT-scan. Eight non-exploitable medical records were excluded. The Fisher test made it possible to compare the qualitative variables with a 95% confidence interval. Any probability (p) value less than 0.05 was considered statistically significant.

3. Results

3.1. Epidemiology

In 5 years, 8,307 head traumas have been recorded. Thirty-five cases were included, including 24 cases of rhinorrhea, 9 cases of otorrhea and 2 cases of rhinorrhea associated with otorrhea (oto-rhinorrhea). There were 34 male and 1 female. The average age was 31.6 years with extremes of 05 years and 60 years. The 20 to 30 age group was affected in 14 cases (40%).

3.2. Clinical

Rhinorrhea was the reason for admission in 11 cases, otorrhea in 1 case. In the remaining 23 cases, it was the physical examination that found liquorrhea in patients admitted for head trauma. CSF leak was objectified immediately on the day of the head trauma in 17 cases; 5 cases in the first week; 3 cases in the second week; 2 cases in the third week and 8 cases after the third after the trauma. The average time to onset of liquorrhea was approximately 109 days (approximately 3 months and 19 days) with extremes of 0 days and 8 years. Liquorrhea was small occurring only during maneuvers and just staining a compress in 16 cases. It was of moderate abundance, occurring intermittently drip depending on the position or during maneuvers in 17 cases. In 2 cases it was of great abundance with a permanent leakag. This liquorrhea was unilateral in 23 patients and bilateral in 12 patients. There were 23 cases of mild head trauma (Glasgow score=14-15) all with a Glasgow coma scale score of 15; 5 cases of moderate traumatic brain injury (Glasgow coma scale score=9-13) and 7 cases of severe traumatic brain injury (Glasgow coma scale score ≤ 8). Of the patients with severe head trauma, 5 presented with otorrhea and 2 with rhinorrhea ($p=0.02066$). There was also a notion of headache (30 cases), otorrhagia (11 cases), rhinorrhagia (9 cases), lunette

ecchymosis (3 cases), cranial / cranio-cerebral wound (8 cases), facial wound (8 cases), peripheral facial paralysis (2 cases), hemiparesis (2 cases).

3.3. Cranio Encephalic CT-scan

A "risk" fracture line was objectified on CT scan in all patients, including 7 skull depressives fractures (Figure 1). This fracture line could explain CSF leak in 29 cases including 2 cases of discreet cerebral hernia at the level of the fracture. In 1 case, a cistern CT scan was performed. It permitted to objective the breach (figure 2). Among the 24 patients who presented with rhinorrhea, the fracture line was located on the walls of the frontal sinus in 18 cases; of the sphenoidal sinus in 2 cases, on the riddled plate of the ethmoidal in 3 cases and on the rock in 1 case. In all 9 patients, who presented with otorrhea, the fracture line was located at on the rock. The 2 cases of otorhinorrhea each had a fracture of the posterior wall of the frontal sinus associated with a fracture of the rock.

On CT scan, the lesions associated with the fracture were pneumoencephaly (27 cases), cerebral contusion (20 cases), acute extradural hematoma (5 cases), acute subdural hematoma (4 cases), and subarachnoid hemorrhage. (1 case).

3.4. Treatment

Three patients were treated on an outpatient basis; 32 in hospital. Conservative treatment of liquorrhea including bed rest, diuretics, laxatives, cough suppressants was practiced in all cases. Lumbar puncture, which is also a conservative treatment, was performed in 18 cases.

Antibiotic prophylaxis with amoxicillin and clavulanic acid was prescribed in all patients as well as analgesic treatment; antitetanus serum and antitetanus vaccine in 29 cases; pneumococcal vaccine in 2 cases.

Two patients were operated on for persistent intermittent rhinorrhea after at least 6 months of conservative treatment. One had benefited from the closure of a fronto-ethmoidal breach by apposition of fat and sticky hemostatic compresses; and the other with a lumboperitoneal CSF shunt. Elsewhere, 5 cases of skull depressives fractures, 3 cases of acute extradural hematoma and 1 case of acute subdural hematoma were urgently operated.

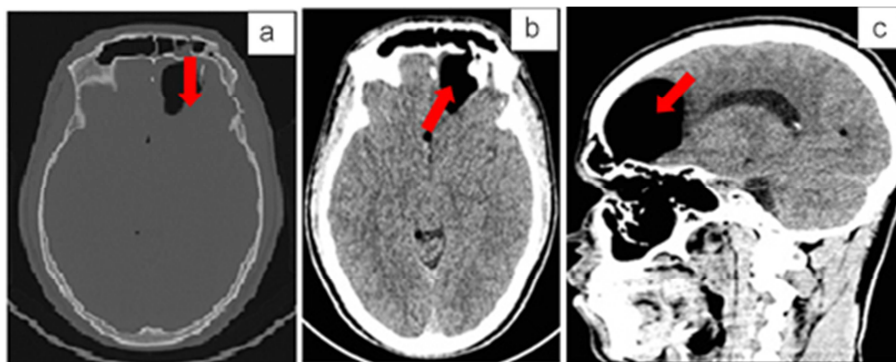


Figure 1. Cranioencephalic CT scan in axial section in bone window (a), axial section in parenchymal window (b), sagittal reconstruction in a parenchymal window (c) showing a fracture of the anterior and posterior walls of the left frontal sinus with compressive intradural pneumoencephaly, indicating the existence of an osteomeningeal breach.

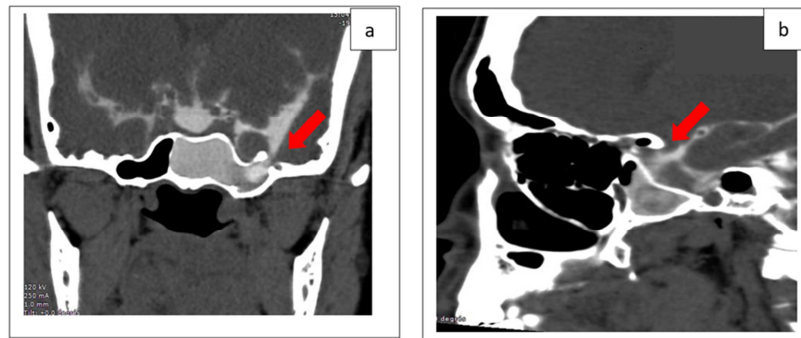


Figure 2. Cistern CT scan in coronal (a) and sagittal (b) reconstruction showing a lateralized fracture to the left of the upper wall of the sphenoid sinus allowing the contrast product to leak into the said sinus indicating the existence of an osteomeningeal breach.

3.5. Evolution

The average hospital stay was approximately 10 days with extremes of 3 days and 210 days (7 months). After an average of 10 days of conservative treatment, CSF leakage had stopped in 32 patients. There were 3 cases of persistent rhinorrhea including 1 complicated case of meningitis. The diagnosis of meningitis was retained in front of a febrile meningeal syndrome with biochemistry of CSF (hypoglycorachia, hyperproteinorachia and hypercellulorachia). At 3 months on average, there were 2 cases of persistent minimal intermittent rhinorrhea and 33 cases of stopping the CSF leak, including 1 case after pneumococcal meningitis treated. After an average of 6 months, there were 34 cases of drying up of CSF leakage including 2 cases of persistent rhinorrhea who were treated surgically. One patient had died of meningitis (febrile meningeal syndrome with hypoglycorachia, hyperproteinorachia and hypercellulorachia) which occurred after recurrence of rhinorrhea. At 1 year, 5 patients were lost to follow-up, 17 cured without sequelae and 12 cured with sequelae: hearing loss (9 cases), anosmia (7 cases), headache (3 cases), memory impairment (2 cases), vertigo (1 case). In short, during the course of liquorrhea, there were 3 cases of meningitis-type complication among the non-operated patients, including 1 death. No operated patient presented an infectious complication ($p=0.834$). Among these 3 cases of meningitis, we noted 1 case of great abundance liquorrhea and 2 cases of moderate abundance liquorrhea ($p=0.166$).

4. Discussion

We noted a predominance of young adult males in our series. This male predominance was also noted by several authors with a sex ratio of 2.7 [9]; 4.5% [10]; 4.7 [11]; 6.6 [12]; 9 [13]; 13.3 [14]. This could be explained by the risky behavior, men lack of protection in circulating and their predominance in activities which expose them more to head trauma. The high frequency of rhinorrhea compared to otorrhea also noted by other authors [15] (72% of rhinorrhea and 28% of otorrhea) could be explained by the fragility of the anterior stage which is more accentuated at the level of the lamina riddled of ethmoid and by the fact that otorrhea can be replaced by rhinorrhea if the eardrum is intact

(otorrhea fluid flowing through the eustachian tube to the nasopharynx and then externalizing through nostrils). In addition, otorrhea occurred in our series most often in severe head trauma and rhinorrhea in mild trauma. The link was statistically significant ($p=0.02$). There was 57.14% severe or moderate head trauma in patients with otorrhea [9].

The clinical diagnosis of liquorrhea was based in our study on the evidence of persistent leakage of a clear rock water liquid in the nose or the ear. No biological examination (glucose assay, beta 2 transferrin) confirming the nature of the CSF was performed. Biology is not essential but it is a great contribution in case of doubt about the nature of the liquid. Liquorrhea was not diagnosed on the day of the head trauma in more than half of the cases in our series, this could be explained by the association of otorrhagia (11/35 cases) and rhinorrhagia (9/35 cases) that may mask the leak of CSF until the bleeding stops. In other series [15], leakage occurred within 2 days of the trauma in 50%, within a week in 70% and within 3 months in 99% of cases.

CT scan guided the diagnosis in 29 cases by showing a fracture line explaining the liquorrhea. The sensitivity of medical imaging in demonstrating an osteodural breach can be significantly improved by making thin CT scan sections with reconstruction, contrast injection or by performing special MRI sequences. Thus the site of the breach was visualized on CT scan by thin sections with coronal reconstruction and / or on MRI in 92.86% [16]. In our series, osteodural breach was visualized in 3 cases including 2 with non-injected CT scan and 1 with cistern CT scan. The search for the breach is not systematic in any case of liquorrhea, especially when a risky fracture line is found. It should intervene in the event of failure of conservation treatment when considering surgery.

Conservative treatment made it possible to dry up the liquorrhea in almost all the cases of our series. Its duration is controversial. It was typically continued for one week [15]. Surgical treatment only occurs when conservative treatment is deemed to have failed [15]. Authors [9] resorted to surgery in 77.27% of cases, still after failure of conservative treatment to close an osteomeningeal breach. The most logical surgical method is to approach the breach and seal it by all means (biological glue, grease, dural plasty, etc.) when it has been clearly identified and is accessible. Otherwise an

CSF shunt (ventriculo peritoneal shunt, lumboperitoneal shunt, external ventricular shunt) can be performed.

CSF Leakage is associated with a risk of developing meningitis which varies from 2% to 50% with an average of 10% despite antibiotic therapy [6, 7, 17]. This meningitis could occur 45 years after post-traumatic liquorrhea [17]. We noted meningitis in 3 out of 35 cases. Other authors [9] reported 22.73% of meningitis; all cases occurred postoperatively. This high rate has revived the controversy that rapid intervention would reduce the risk of meningitis in the event of an osteomeningeal breach [6, 7]. In our series, neither the abundance of liquorrhea ($p=0.166$) nor the conservative treatment ($p=0.834$) favored the occurrence of meningitis. This risk of meningitis, which can lead to death, as was the case for 1 patient in our series, partly explains the almost systematic prescription of antibiotic prophylaxis in our series. This attitude is controversial in the literature. Indeed, some authors in Africa [18, 19] based on their own experience argue that prophylaxis with antibiotics would reduce the incidence of meningitis. Other studies [13], on the other hand, have concluded that there is no significant difference in the incidence of meningitis with antibiotic prophylaxis. However, according to them [13], the presence of a dural opening significantly increased the risk of infection. We believe that antibiotic prophylaxis and / or vaccination remain necessary in the face of any open trauma to the skull, especially in our countries of the meningitis belt and in view of the inadequacy of our aseptic conditions.

5. Conclusion

The majority of cases of liquorrhea were diagnosed on average three months after a benign traumatic brain injury. Rhinorrhea was more common than otorrhea which was noted in severe head trauma patients. Clinical diagnosis was based on the evidence of a clear rock water liquid in the nose or ear. Highlighting the breach was difficult in our work context where the scanner sometimes gave good directions. Treatment was essentially conservative; the prognosis very often favorable. However, a few cases of meningitis-type complication have been noted, marking the prognosis.

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