Subdural Hematoma Complicating Ventriculoperitoneal Shunts: An Algerian Centers Experience

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Abstract

Introduction Subdural hematoma can occur as a complication of a ventriculoperitoneal shunt (VPS), and it should be considered in any patient who present a shunt dysfunction or who does not show the expected recovery after revision of a shunt. Computed tomography (CT) scan is a quick and easy way of detecting subdural hematoma.

Materials and Methods We conduct a retrospective study of 17 patients. All of them are admitted for a subdural hematoma on a VPS. The diagnosis in 13 cases is made by CT scan; three cases by brain MRI.

Results We operated 16 patients and the evacuation of the hematoma with revision of the shunt was performed; we used an adjustable shunt for three patients and endoscopic third ventriculostomy in one case. The operative outcomes were favorable in 12 patients; there were 4 recurrences, 2 of which required evacuation of the hematoma through a bone flap.

Conclusion The subdural hematoma is a complication observed during the surgical treatment of the hydrocephalus and can be a serious issue. We suggest that a brain CT scan should be routinely performed in symptomatic patients with VPS.

Keywords
- ► subdural hematoma
- ► hydrocephalus
- ► ventriculoperitoneal shunt

Introduction

Subdural hematoma is one of the complications of a ventriculoperitoneal shunt (VPS) procedure, and it should be considered in any patient who presents with a malfunctioning shunt. The incidence of subdural hematoma related to overdrainage varies considerably in published reports, and appears to be approximately 3 to 12%.[1,2] The subdural hematoma in shunted patients has no specific symptoms but computed tomography (CT) scan is a quick and easy way of detecting subdural hematoma.

The objective of our study was to assess the epidemiologic, clinical, and therapeutic aspects of subdural hematoma in shunted patients.

Materials and Methods

The study was conducted in the neurosurgical department of Centre Hospitalier Universitaire of Bab El Oued in Algiers, Algeria. It was a retrospective study of 18 years from January 2000 to December 2018. We collected and studied files of 17 patients admitted for subdural hematoma on a VPS. We summarize different reasons that prompted the placement of shunt in ►**Table 1.**

Cervical occipito vertebral malformations are the most frequent initial pathologies found in five patients representing 29.41%. The surgical technique consisted of placement of a ventriculoperitoneal fixed drainage shunt.

Results

This is a case of a patient, operated for tetraventricular hydrocephalus (►**Fig. 1**) and bilateral subdural hematoma (SDH) after DVP shunt insertion (►**Fig. 2**). We operated the patient and removed the SDH through burr holes and also removed the shunt **(►Fig. 3)** and performed an endoscopic third ventriculostomy (ETV).

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During our study, we registered 17 patients admitted for a subdural hematoma on a VPS. There were 12 males (70.60%) and 5 females (29.40%). The sex ratio male to female (M:F) was 2.4. The mean age was 27 years with extremes from 5 months to 79 years. The childhood age and the range 17 to 40 years are the most frequent 35.29% for each (►**Table 2**).

All 17 cases underwent VPS as initial treatment of the hydrocephalus (►**Table 3**). Signs of intracranial hypertension (nausea and vomitting) are the most frequent clinical signs in 13 (76.47%) patients. The diagnosis of the subdural hematoma is made in 13 cases by CT scan and in 3 cases by brain MRI. Thirteen (76.47%) patients presented bilateral hematoma.

We operated 16 patients and performed the evacuation of the hematoma through burr holes with revision of the shunt. We used the programmable shunt in two patients and ETV in one case, and we put one case under observation (►**Table 4**).

The operative outcomes were favorable in 12 patients marked by the disappearance of signs of intracranial hypertension; we notice four recurrences, one of which required evacuation of the hematoma through a bone flap and programmable valve, and the other one a bone flap and ETV.

Table 1 Summery of different reasons that prompted the placement of shunt

Initial pathology	Number	Frequency (%)
Cervico-occipito-vertebral malformations	5	29.41
Communicanting hydrocephalus	4	23.52
Mesencephalic tumors	2	11.76
Pineal process	1	5.88
Sylvius aqueductal stenosis	1	5.88
Chronic hydrocephalus	1	5.88
Dandy–Walker malformation	1	5.88
Encephalopathy	1	5.88
Post meningitis hydrocephalus	1	5.88
Total	17	100

Discussion

Pathogenesis is probably not different for subdural hematoma of any etiology, but the negative ventricular pressure produced by overdrainage appears to be an important additional predisposing factor.[2] Reactive subdural hematoma is believed to be the result of bleeding into the subdural space from the sudden reduction of intracranial pressure induced by cerebrospinal fluid (CSF) drainage. When the distended ventricles are drained and the intraventricular pressure is reduced, the brain tends to collapse, the subdural space widens, and disruptive traction is brought to bear upon the bridging veins. Skull enlargement, if present, exaggerates this effect because of the great discrepancy in volume between the size of the brain and the cranial cavity.[1] According to Pachatouridis et al[3] the valve's opening pressure is the most important factor in determining CSF drainage. This is attested by the study of Boon et al that the subdural effusions occurred in 71% of patients with a low-pressure shunt and in 34% of patients with a medium pressure shunt.[4] The incidence of subdural hematoma related to overdrainage is difficult to evaluate because of lack of published series but it varies considerably in published reports. Illingworth in 1970 reported 8 cases of SDH in a series of 175 patients representing 4, 5%[5] and Samuelson et al in 1972 reported an incidence of 20%.[6] According to Boon et al,[4] the incidence depends on the type of the valve and reported subdural effusions to occur in 71% of patients with a low pressure shunt and in 34% of patients with a medium pressure shunt. After using a programmable valve, Pachatouridis et al[3] reported a nontraumatic subdural fluid collection (hygroma) in 12 (9.4%) patients. Code et al reported an incidence of 1.4% in a series with a fixed drainage shunt.[7]

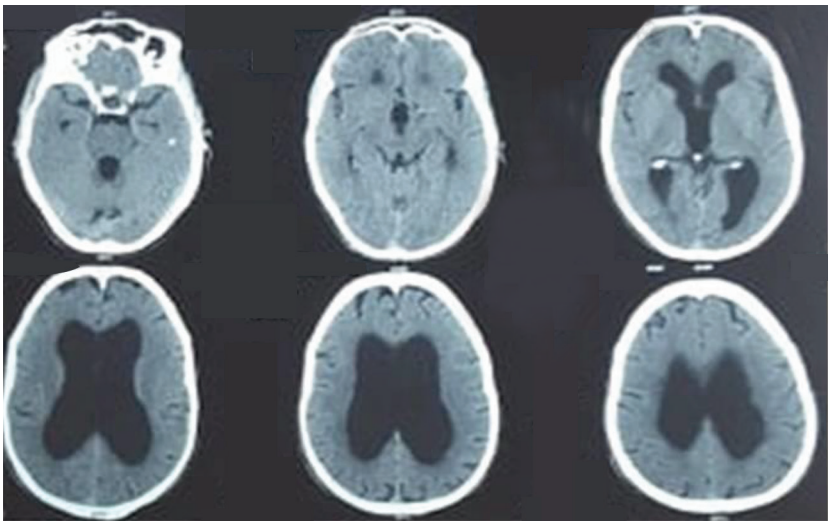

Fig. 1 Axial CT scan showing tetraventricular dilation. CT, computed tomography.

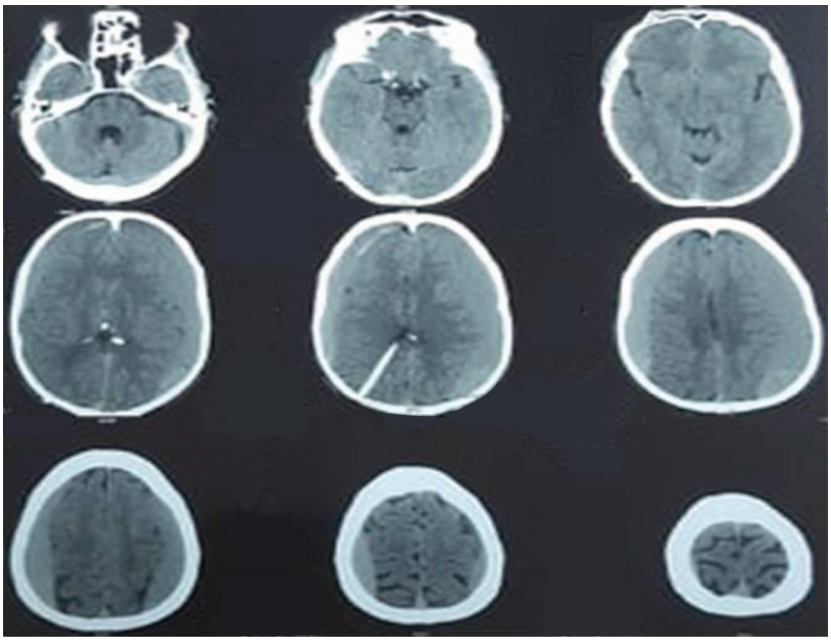

Fig. 2 Axial CT scan showing right intra ventricular shunt and bilateral subdural hematoma. CT, computed tomography.

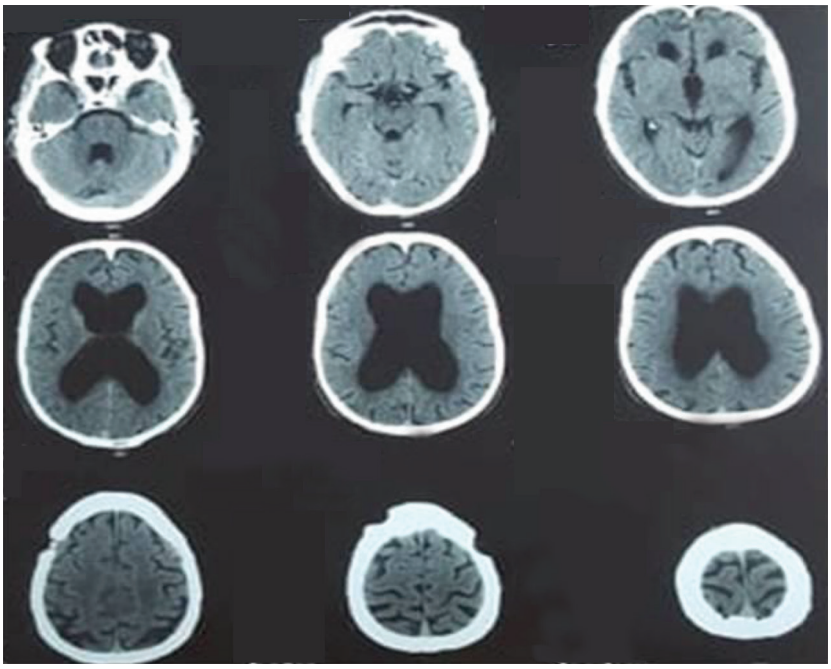

Fig. 3 Postoperative axial CT scan after evacuation of the SDH and removal of the ventricular shunt. CT, computed tomography; SDH, subdural hematoma.

Table 2 Age range of admitted patients

Age (y)	Number	Frequency (%)
0–16	6	35.29
17–40	6	35.29
41–60	3	17.64
>60	2	11.76
Total	17	100

Table 3 Clinical signs of the subdural hematoma

Clinical signs	Number	Frequency (%)
Intracranial hypertension	13	76.47
Cerebellar syndrome	2	11.76
Pyramidal tract syndrome	1	5.88
Macrocranie	1	5.88
Total	17	100

Table 4 Treatment of the hematoma and the hydrocephalus

Treatment of hematoma and hydrocephalus	Number	Frequency (%)
Burr holes and valve revision	13	76.47
Burr holes and programmable valve	2	11.76
Burr holes and ETV	1	5.88
Observation	1	5.88
Total	17	100

Abbreviation: ETV, endoscopic third ventriculostomy.

In our series, cervical occipito vertebral malformations are the most frequent cause of hydrocephalus representing 29.41% followed by communicanting hydrocephalus 23.52%. Subdural hematomas in shunted patients do not cause specific symptomatology. While some subdural collections are benign and can resolve spontaneously, others may grow to cause significant mass effect and neurologic compromise.[8] The most frequent clinical signs are signs of intracranial hypertension in 76.47% of patients, followed by cerebella syndrome in two patients representing 11.76% of patients.

We operated 16 patients and performed the evacuation of the hematoma through burr holes with revision of the shunt in 13 patients (76.47%); for two patients, after the evacuation of the hematoma through burr holes, we changed the shunt to programmable valve. In the series reported by Boon et al, most of the patients were asymptomatic and resolved spontaneously; only approximately 16% of the subdural collections that formed required surgical drainage; 4 we put one patient under observation and the hematoma resolved spontaneously.

The advancement of adjustable shunt brings many advantages; Fukuhara et al supported that there have been cases reported in which adjustment of the shunt valve alone allowed for complete resolution of postshunt SDHs.[9]

The significantly high proportion of noninvasive treatment in the group with adjustable shunts also indicates that if patients with fixed valves had received adjustable shunts instead it is most likely that many surgical procedures could have been avoided.[10]

The postoperative outcome was favorable in 12 patients marked by the disappearance of signs of intracranial hypertension, but we noticed four recurrence cases. Although not significant, the mortality rate at 1 year, after a complication, was higher in the patient group undergoing surgery than in the group treated with opening pressure adjustments. This suggests that a nonsurgical treatment could be preferable than a surgical one.[10]

Conclusion

The subdural hematoma is a complication observed during the surgical treatment of the hydrocephalus and can be a fatal complication. We suggest that a brain CT scan should be routinely performed in symptomatic patients with VPS. Use of the newer programmable shunt can help reduce the problem of over functioning VPS and its related complications.

Conflict of interest
None declared.

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