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Case Report

Subdural haemorrhage following endoscopic third ventriculostomy. A rare complication

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Summary

Subdural collections or hematomas are frequently observed after shunt placement [7–9, 13], but rarely after ETV [6]. A review of literature revealed 7 cases [1, 5, 6, 10, 12], of which only 1 was symptomatic [5]. We will discuss the causes, management, and methods of prevention of this complication and we will present a case of symptomatic subdural haematoma, following endoscopic third ventriculostomy for illustration.

Keywords: Endoscopic third ventriculostomy; subdural haemorrhage; overdrainage.

Introduction

Endoscopic third ventriculostomy (ETV) has now superceded ventriculoperitoneal shunts in many institutions as the primary treatment of obstructive hydrocephalus. Most of the previous reports focus on failure or under-functioning of ETVs, but can ventriculostomies overdrain?

Illustrative case

A 16-year-old male patient with a history of moderate learning impairment presented with a 5 years history of slowly worsening ataxia followed by a 2 months history of frontal headaches. The patient underwent MRI which demonstrated ventricular enlargement with congenital aqueductal stenosis. An endoscopic third ventriculostomy was performed using a 6.5 mm rigid Gaab lenscope with an outer diameter of the operating sheath of 8 mm, through a right frontal burr hole. The ventriculostomy was carried out using a blunt probe followed by dilatation using 3F Fogarty balloon to about 10 mm diameter. The operative time was 15 minutes, due to the short operative time we did not use continuous irrigation but we replaced the lost CSF by Ringer's lactate solution at the end of the procedure. Postoperatively, there was immediate amelioration of the patient's headaches. His ataxia showed signs of slow improvement and he was discharged a few days later. One month later, the patient was readmitted complaining of significantly worsening gait disturbance and severe headache. The CT showed a right subacute subdural haematoma Fig. 1.

The subdural haematoma was evacuated by a minicraniotomy and the patient recovered uneventfully. Follow-up for 2 years has not revealed any recurrence of the subdural collection or hydrocephalus.

Discussion

Endoscopic third ventriculostomy has become a popular alternative to ventricular shunts for non-communicating hydrocephalus. Although endoscopic third ventriculostomy is a safe procedure, several complications related to this procedure have been reported in the literature. These included intracerebral bleeding, cranial nerve palsies and CSF leak [12]. Subdural haemorrhage, a common postoperative complication of extracranial shunting for hydrocephalus, is usually caused by excessive drainage of cerebrospinal fluid. Subdural effusion is thought to be very rare following ETV [5].

Schroeder *et al.* [10], reported 3 subdural collections post ETV, in their series of 193 ETVs (1–2%). Two patients turned out to be dependent on their shunts. None of the subdural collections were symptomatic and no treatment was required. We encountered only one CSDH in 73 ETVs in our series (1.4%) which is in concordance with the frequency of SDH in Schroeder *et al.*'s series.

The etiology of subdural haemorrhage post ETV includes damage to a cortical vessel or bridging vein at the time of the ETV, or bleeding from a scalp vessel

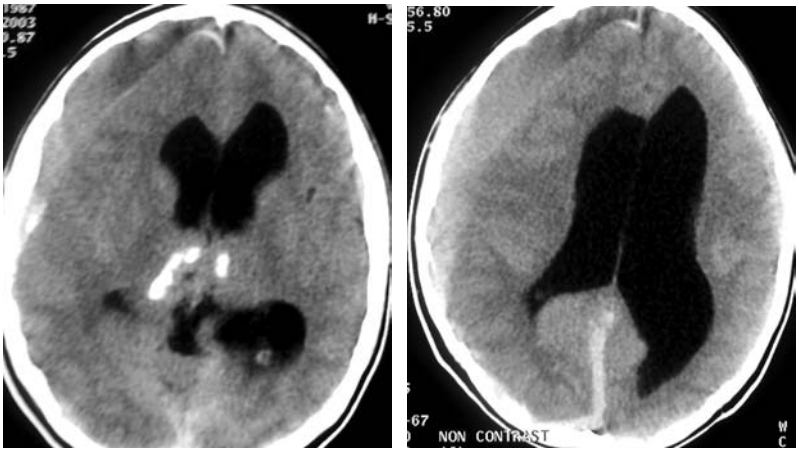

Fig. 1. CT brain showing right side subdural haemorrhage, with compression of the ipsilateral ventricle

that accumulated in the subdural space. It has been mooted that sudden excessive CSF drainage during the ventriculostomy may enlarge the subdural space, tearing a bridging vein, thereby allowing the collection of subdural fluid [12].

Patients with ''cranio-cephalo disproportion'' i.e. long standing significant ventricular dilatation with a thin cortical mantle are predisposed to develop SDH, because the brain has been stretched for many years and does not have the capability of thickening following ETV (loss of the vesico-elastic property of the brain). In this circumstance, an excessively mobile brain can create a subdural by tearing a bridging vein. This would not require ''overdrainage'' of the ETV but simply normalization of the ICP. A large cortical puncture in patients' with large ventricles may cause CSF to flow out in the (artificial) subdural space and may first cause a subdural hygroma, which may later become a subdural haematoma by venous bleeding [10]. CSF collection persisting in the subdural space for more than a few weeks is thought to induce migration or proliferation of inflammatory cells derived from the dural border cells, resulting in a layer of fibroblasts along the dura, which develops into the outer membrane of the haematoma. Moreover, delayed reabsorption of subdural effusion is likely to result in haemorrhage into the subdural fluid due to either tearing of bridging veins or bleeding from the neomembrane [4]. Cine-phase MRI may help to show if there is a flow of CSF through the cortical puncture into the subdural space and also, to check if there is adequate flow through the ventriculostomy.

In this case we used a relatively large diameter endoscope (operating sheath diameter 8 mm) this could have contributed to the CSF leak through a large cortical puncture into the subdural space.

Given the fact that the subdural occurred in this case weeks after the ETV overdrainage is a consideration, we do not think that the subdural haemorrhage occurred immediately postoperative i.e. due to a torn bridging vein or damaged cortical vessel intraoperatively, because of the immediate postoperative disappearance of the patient's headache as well as his symptomatic improvement that lasted for at least 2 weeks. Unfortunately, we did not have an immediate postoperative CT brain to verify this.

Conclusion

We think that the etiology of the subdural haemorrhage may be due to excessive CSF loss during the ETV procedure in a patient with ''cranio-cephalo disproportion'' causing SDH or due to a subdural hygroma from leakage of CSF through the cortical hole after the operation that transformed into a SDH. Thus the surgeon has to be very cautious in these cases and efforts should be made to avoid rapid drainage of large quantities of CSF by using a small diameter endoscope, and making a small cortical puncture so that the endoscope fits snugly into it. Also, by keeping the ports of the endoscope turned off when irrigation is not going on, and lost CSF should be replaced with lactated Ringer's solution. Approximately 25 ml should be enough to fill the ventricles [3]. Using tissuecoll to seal the cortical opening may also be useful to reduce CSF leak through the corticotomy into the subdural space.

Follow up scan is recommended as the haematoma may be asymptomatic. We should also be aware of the possibility of late onset SDH from asymptomatic persistent subdural effusion.

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