SHORT REPORT

Benign intracranial hypertension: a cause of CSF rhinorrhea

D Clark, P Bullock, T Hui, J Firth

Abstract
Four patients undergoing treatment for benign intracranial hypertension presented with spontaneous CSF rhinorrhea. The four patients, all women, were aged between 33 and 44 years. They had been receiving treatment for benign intracranial hypertension for a period ranging from eight months to 11 years, before developing the CSF leak. There was no history of previous head injury and there were no congenital anomalies of the floor of the anterior fossa. The site of the CSF fistula was localised to the cribriform plate in all four cases. The pathophysiology of the CSF rhinorrhea and the surgical management of this group of patients are discussed. The authors propose that benign intracranial hypertension should be included in the classification of high pressure CSF leaks.

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Ommaya's original classification of high pressure CSF leaks did not include benign intracranial hypertension.1 He described tumours and untreated hydrocephalus as the most common causes of this condition. He speculated on a third group such as benign intracranial hypertension with chronically raised pressure "placing the fragile roof of the nose at risk" and leading to rhinorrhea, but he had not witnessed such a case. Since Ommaya's classification, several authors describing the surgical repair of CSF leaks have included patients with benign intracranial hypertension.2-5 In this paper the mechanisms by which a CSF leak can occur are discussed, as well as the difficulties that may be encountered in securing a direct repair of the CSF fistula. The distinction between high and low pressure CSF leaks is emphasised because it is usually important to treat the underlying cause of the high pressure, before a satisfactory repair of the CSF leak can be effected.

Patients and methods
Four patients who were treated for benign intracranial hypertension at the Neurosurgical Department, University Hospital, Nottingham between 1986 and 1990 are described (table). The four women were aged between 33 and 44 years, and had been diagnosed as having benign intracranial hypertension, receiving treatment for a period ranging from eight months to 11 years, before developing CSF rhinorrhea. All the patients had complained of the classic symptoms of headache and visual disturbance, and were found to have papilloedema at the time of the original presentation. Neurological examination was normal. Diagnosis was by exclusion with a normal CSF under elevated pressure. All patients had CT and MRI scans as well as cerebral angiography to exclude other disorders.

The initial medical management was by lumbar puncture, weight reduction, diuretics, and steroids. Patients referred for surgery had progressive visual loss or had failed to improve with medical therapy. Once the CSF leak had been diagnosed the site of the fistula was identified in each case by CT scan with fine coronal cuts. The fistulas were all discovered in the region of the cribriform plate and no congenital anomalies of this area were identified.

CASE 1
This 33-year-old female with resistant benign intracranial hypertension developed a CSF rhinorrhea while on the waiting list for a lumboperitoneal shunt. The CSF leak resolved after insertion of the shunt. Six months later the CSF rhinorrhea recurred and the shunt was found to be blocked.
Revision of the shunt has been partially successful with the patient still experiencing intermittent CSF rhinorrhoea and occasional headaches. The patient had no papilloedema or visual disturbance on review at one year follow up, and she has declined any further intervention.

**CASE 2**

A 44-year-old female had been treated for benign intracranial hypertension for 19 months before developing CSF rhinorrhoea. Primary closure of the CSF fistula by craniotomy was attempted but frustrated by raised intracranial pressure. A lumboperitoneal shunt was inserted producing resolution of both the rhinorrhoea and symptoms and signs of benign intracranial hypertension. However, following the shunt insertion the patient complained of low pressure headaches which persisted, and the shunt had to be occluded. At followup she remained symptom-free with no recurrence of the CSF leak, presumably as a result of spontaneous resolution of the benign intracranial hypertension.

**CASE 3**

This 42-year-old female had been treated for benign intracranial hypertension for more than four years before developing CSF rhinorrhoea. Primary repair of the CSF fistula was undertaken by a craniotomy using an extradural approach. At operation, the intracranial pressure was high but the repair was accomplished. After the operation the patient was treated with a lumbar CSF drain which was continued for five days. She has remained symptom-free five years after this procedure.

**CASE 4**

A 34-year-old patient had a lumboperitoneal shunt inserted as treatment for her resistant benign intracranial hypertension. Six years after this procedure the patient developed a CSF rhinorrhoea, and the shunt was found to have migrated and not be functioning. She subsequently underwent multiple shunt revisions and the CSF rhinorrhoea resolved; she then developed an intracranial aerocele (fig 2). At this point a craniotomy was undertaken to repair the site of the fistula directly. At a six month followup there had been no further CSF rhinorrhoea and the aerocele had resolved.

**Discussion**

Benign intracranial hypertension most commonly affects women of child bearing age and is usually a self limiting condition. Most patients are managed successfully by non-surgical methods. A shunting procedure or optic nerve decompression may be required to control papilloedema in refractory cases. The association between benign intracranial hypertension and spontaneous CSF rhinorrhoea is rare.

These four female patients illustrate the more severe form of benign intracranial hypertension. They had all received maximum medical treatment and two had described symptoms for over four years. There were no other unusual or unique features which could help to identify other patients with benign intracranial hypertension at risk of developing a CSF leak.

It appears that the raised intracranial pressure was the only aggravating condition. Trauma and congenital anomalies had been excluded. The actual mechanism by which benign intracranial hypertension may precipitate a CSF leak is unclear. Locke proposed that the exaggerated CSF pulsatile flow, seen with all forms of raised intracranial pressure, could lead to expansion and eventual rupture of the arachnoid sleeve surrounding

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**Initial presentation and treatment**

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Symptoms and signs</th>
<th>Investigations</th>
<th>CSF pressure (cmH2O)</th>
<th>Initial treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>33</td>
<td>Headaches, Double vision, Gross papilloedema, Enlarged blind spots</td>
<td>CT scan: normal ventricles</td>
<td>30</td>
<td>Multiple lumbar punctures, Steroids, Weight reduction, Multiple lumbar punctures Steroids</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>44</td>
<td>Headaches, Obscuration Papilloedema</td>
<td>CT scan: normal ventricle size</td>
<td>34</td>
<td>Multiple lumbar punctures, Acetazolamide</td>
</tr>
<tr>
<td>3</td>
<td>Female</td>
<td>42</td>
<td>Dizzy spells, Papilloedema, Enlarged blind spots</td>
<td>CT scan: normal ventricle size</td>
<td>34</td>
<td>Steroids, Multiple lumbar punctures, Thecoperitoneal shunt</td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>34</td>
<td>Headaches, Blurred vision, Enlarged blind spots</td>
<td>CT scan: normal ventricles</td>
<td>30</td>
<td>Steroids, Multiple lumbar punctures, Thecoperitoneal shunt</td>
</tr>
</tbody>
</table>

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**Figure 2** Intracranial aerocele post lumboperitoneal shunt.
Benign intracranial hypertension

the olfactory filaments which pass through the pits in the cribriform plate.

It could also be speculated that the empty sella syndrome, which has been reported in association with benign intracranial hypertension, may allow the transmission of the increased CSF pulsation through the incompetent diaphragma sellae, thereby eroding the sella and eventually leading to a CSF leak from this site.19

Six other patients with benign intracranial hypertension who developed spontaneous CSF leaks have previously been included in surgical reports on the treatment of non-traumatic CSF rhinorrhoea.2 5 These six patients have a similar age distribution, sex, and mode of presentation to the four patients described here. The cribriform plate was the site of CSF leak in five of the patients and Bejerrre et al3 described one patient who developed a leak from the sella turcica. From these two groups of patients, it would appear that the cribriform plate and the sella region are the most common sites for the development of a high pressure CSF leak.

In this study the site of the CSF fistula was adequately demonstrated by coronal CT scans in all four patients, but if this investigation is un rewarding, evaluation by metrizamide CT cisternography or CSF radioactive isotope tracer studies has been recommended.4 10

It is of interest that, during this study, no patients' vision deteriorated after development of the CSF leak, but high pressure CSF rhinorrhoea rarely stops of its own accord and places the patient at risk of meningitis. Surgical repair was therefore recommended to prevent this complication.

It is usually important to treat the underlying cause of the high pressure before a satisfactory repair of the CSF leak can be undertaken. A lumbo peritoneal shunt has proved useful in controlling the raised intracranial pressure in benign intracranial hypertension. However, the fistula may not heal completely after a shunting procedure alone, and the patient may be exposed to an increased risk of infection because the gradient across the fistula has been reversed. Eljamel and Foy4 reported this complication in a patient who developed meningitis after receiving a lumbo peritoneal shunt for CSF rhinorrhoea. Indeed, two patients in this study presented with a recurrent CSF rhinorrhoea as a result of shunt failure. One patient (case 4) had an acute exacerbation of her headaches after blowing her nose and was discovered to have an extensive pneumo cephalus (fig 2). This is further evidence that the fistula may not close spontaneously after the shunting procedure. Weisberg LA, Housepian EM, Saur DP. Empty sella syndrome as complication of benign intracranial hypertension. J Neurol Neurosurg Psychiatry 1977;40:177–80.