

Trauma

Severe craniofacial fractures with frontobasal involvement and cerebrospinal fluid fistula: indications for surgical repair

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Abstract

Background: The management of posttraumatic cerebrospinal fluid (CSF) fistulae is a controversial topic. Although recent literature shows that endoscopic repair of CSF fistula is efficacious and minimally invasive, in specific conditions open operative approach remains imperative.

Methods: A series of 36 patients underwent surgery for posttraumatic CSF fistula according to specific selection criteria. These criteria included: bone displacement more than 1 cm (5 cases), location of fracture in proximity to the midline (6 cases), involvement of cribriform plate (12 cases), presence of encephalocele (3 cases), and failure of the conservative treatment (10 cases). The dural defect was closed using vascularized pericranium and fibrin glue. Closure of the basal bone defect was necessary in very large fractures or in special localization of the fistula, such as near the optic nerve. Mean clinical follow-up was 5.7 years.

Results: Two patients presented meningitis without sequelae, and 12 with hyposmia. One patient died of the severity of the primary brain injury and associated extracranial lesions. None of the patients had recurrence.

Conclusions: Our results indicate that surgical dural repair in selected cases is related to low morbidity and mortality preserving from delayed risks such as recurrence and infections.

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Keywords:

Cerebrospinal fluid fistula; Fracture; Head injury; Management; Meningitis; Rhinorrhea; Surgical repair

1. Introduction

About 80% of all cerebrospinal fluid (CSF) fistulae result from head injuries with skull base fractures [26,42]. Spontaneous fistulae are only 3% to 4% of all CSF fistulae and iatrogenic ones are about 16%, a result of operations within the nasal and paranasal cavities and the skull base [26].

Dandy [9] reported in 1926 the first successful dural repair of CSF fistula. At present, management of posttraumatic CSF fistulae remains a controversial topic.

Although recent literature shows that endoscopic repair of CSF fistula is efficacious and minimally invasive, there

are specific conditions in which open operative approach is mandatory.

The goal of this study is to assess the efficacy of our protocol that has been applied on a selected group of 36 patients affected by posttraumatic CSF fistula.

2. Materials and methods

Between January 1997 and December 2000, 58 patients with cerebrospinal fistulae by anterior skull base fractures were admitted to our Institution. Of these 58 patients, 36 were surgically treated, whereas the remainder were treated successfully with conservative management.

The group of 36 patients surgically treated is the object of this study.

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There were 29 men and 7 women. Age ranged between 16 and 62 years (mean, 38 years).

All patients had clinical history of head trauma; this was classified on the basis of Glasgow Coma Score as minor (1 patient), moderate (19 patients), and severe (16 patients). Traffic accidents were the most frequent cause of head trauma.

Cerebrospinal fluid rhinorrhea occurred immediately after trauma in 30 cases and in following days (1–5) in 6 cases.

Severe additional extracranial lesions were present in 7 patients. Associated intracranial lesions causing cerebral compression are reported in Table 1. We have divided the patients into 3 groups according to the surgical timing:

- Group A (18 patients): early surgical repair (emergency operative intervention or within 5 days from trauma);
- Group B (10 patients): surgical repair 8 days after trauma;
- Group C (8 patients): surgical treatment from 12 to 25 days after trauma.

Early operation was performed in patients with compressive hematoma, open trauma, severe bone derangement, and severe CSF discharge. Delayed operation was performed in 10 patients (group B) to attempt conservative treatment, and in 8 patients (group C) to await the stabilization of the vegetative parameters and the regression of the cerebral edema. Conservative treatment for patients in group B consisted of bed rest, continuous CSF lumbar diversion for 5 to 7 days, and carbonic anhydrase inhibitor administration. We used the same treatment for group B in patients of group C before surgery, but CSF diversion was not applied in patients with hypertensive pathology.

All patients were studied by fine-slice computed tomography (CT) with multiplanar reconstructions and bone window. Twenty-six patients had magnetic resonance imaging (MRI) and 8 had CT cisternography. Four patients had a fracture of posterior wall of the frontal sinus, the remainder presented with craniofacial fractures. Antibiotic prophylaxis (piperacillin, amikacin, and antibiotics on the basis of the antibiogram from nasal tampon) was administered in all patients.

The osteodural repairs were performed via craniotomy in all 36 patients. In all cases the dural defect was closed using vascularized pericranium. Fibrin glue was used routinely on

Table 2
Surgical approaches in our series

Surgical approach	No. of patients
Frontobasal bilateral	20
Frontobasal lateral	12
Transfrontal sinus	2
Frontonasal	2

dural suture. All patients had CSF diversion for 5 to 6 days postoperatively.

The closure of the basal bone defect was necessary in very large fractures or in particular location of the fistula, such as near the optic nerve.

Surgical approaches used are described in Table 2. In several patients we used the fracture line to design the limit of the craniotomy.

3. Results

In all patients surgically treated the first dural repair was successful. Meningitis without sequelae was observed in 2 cases of group C. One patient died 22 days after operation because of the severity of the primary brain injury and associated extracranial lesions.

Serial clinical examinations were performed to follow all patients. Follow-up ranged from 4 to 7 years (mean, 5.7 years). None of the patients treated with surgery had recurrence. Twelve patients with fracture involving cribriform plate presented with hyposmia. In these 12 cases, impairment of the sense of smell occurred since the trauma.

In 22 of the 32 patients treated conservatively, CSF leakage ceased within 1 week. These patients were discharged neurologically intact, except for impaired sense of smell present in 3 of them. In 10 patients, conservative management failed and they were successively submitted to surgery.

Five out of the 22 patients treated conservatively were readmitted for meningitis, recurrent rhinorrhea, or both. Four patients had recurrent CSF leakage from 3 to 19 months after discharge. Three of these patients developed bacterial meningitis. In 1 patient with meningitis, spinal arachnoiditis, responsible for the formation of multiple compressive arachnoid cysts, occurred. One patient had only meningitis.

4. Discussion

Cerebrospinal fluid fistulae have always been a diagnostic and therapeutic challenge.

The selection of patients who do or do not require surgical treatment, timing of surgery, and antibiotic prophylaxis are questions widely debated in the neurosurgical literature. Most neurosurgeons do not follow the advice of Loew et al [25] and Cairns [6] that all CSF fistulae should be treated surgically as soon as possible [18,26], but

Table 1
Associated lesions in the 3 groups of our series

AL	H	BC	P	DBE	PI	ONC	Severe AEL
Group A	9	6	4			2	
Group B		3		2			
Group C				5	6		7
Total	9	9	4	7	6	2	7

AL indicates associated lesions; H, cerebral hematoma; BC, brain contusion; DBE, diffuse brain edema; PI, penetrating injury; ONC, optic nerve compression; AEL, associated extracranial lesions.

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