

The Place of Transcranial Surgery in the Treatment of Osteomeningeal Breaches

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Abstract:

Objective: The main objective of this study is to share our experience and the interest of the trans-cranial surgery in the treatment of post-traumatic osteo-dural defect.

Patients and methods: Between the year 2009 and 2021, 182 patients were operated on for an osteo-dural defect of multiple natures and locations on the anterior and middle skull base.

Only 32 patients were operated on by the transcranial approach.

Concerning the origin of the trauma, it is most often a traffic or road accident.

The study included 10 women and 22 men, the average age was 24 years old (ranging from 16 to 62 years).

The patients were operated on between 2009 and 2021 by a transcranial approach with a long-term follow-up ranging from 1 to 12 years (clinical and radiological follow-up).

Results: The main symptom was unilateral rhinorrhea in all patients (100%), on the right side in 22 patients (68%) and on the left side in 10 children (32%) evolving for a period of time varying between 02 months to 24 months.

* Recurrent meningitis was observed in 15 cases (47%). * Disturbances of consciousness in 02 cases (6%); and a case of loss of smell or anosmia have been reported.

Three patients have been operated on previously for head trauma (depressed frontal fracture) and who was subsequently treated for rhinorrhea by lumbar subtractive punctures.

In 27 patients (84%) we found that the defect is associated with small post-traumatic meningocele without cerebral hernia then in 05 patients (16%), there was a post-traumatic meningoencephalocele associated with a more or less large osteo-dural defect.

The most frequent localization is the cribriform plate of the ethmoid and the roof of the anterior and posterior ethmoid in all patients (100%). The width of the defect is variable from one patient to another.

We have observed that the defect is more frequent on the right side than on the left.

Immediate postoperative morbidity was marked by the onset of an epileptic seizure in two patients, partial frontal syndrome in one patient.

A frontal mucocele was observed in 04 patients who required a short-term surgical revision. After a long-term follow-up ranging from 1 to 12 years, we resumed two cases of osteomeningeal defect, the results of which was a 100% success rate.

Conclusion:

Secondary cerebrospinal rhinorrhea has an osteomeningeal breach that sits in the cribriform plate and the roof of the ethmoid are managed endoscopically endonasally, and with a transcranial approach in case of a posttraumatic opening of the posterior wall of the frontal sinus and in the case of the endoscopic surgery failure.

It is a surgery with a certain rate of postoperative morbidity, but it remains the only surgical solution in case of failure of the endoscopic surgery.

Key words: rhinorrhea, frontal sinus, cribriform plate, transcranial approach, mucocele.

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I. Introduction:

Osteomeningeal breaches are defined by a solution of continuity of the bone and the meninges of the base of the skull, most often post-traumatic. Rhinorrhea is the main symptom of this pathology which poses a problem of diagnosis by its localization in the base of the skull. Surgery allows a radical treatment of this pathology with the objective of rebuilding the base of the skull with the creation of a separation between the intracranial compartment and the sinuses and nasal cavities (1.2.3.4).

Endoscopic endonasal surgery offers an essential alternative in the treatment of osteo-dural defects promising better results for patients who are candidates for this technique (5.6).

Several closing techniques have been described and several materials have been innovated and used to repair a large osteo-dural defect (6.7.8)

Transcranial surgery is still relevant, but its indication remains limited.

In this article we will share our experience regarding this surgery, its indications and its limits.

II. Patients And Methods:

Between 2009 and 2021, 182 patients were operated on for an osteo-dural defect of different natures sitting on the anterior and middle level of the skull base.

Only 32 patients were operated on by the transcranial approach.

III. Results:

We had 32 patients who were operated on by the transcranial approach presented an osteo-dural breach on the anterior level of the skull base.

All our patients presented with rhinorrhea associated with an osteo-dural defect in the base of the skull. All the patients were referred to us by different specialists after a precise diagnosis was established (neurosurgeons, ENT, pediatrician and infectious disease specialist).

Concerning the origin of the trauma, it is most often a traffic or road accident.

Our study included 10 women and 22 men, the average age was 24 years (extremes ranging from 16 to 62 years).

* The main symptom was unilateral rhinorrhea in all patients (100%), on the right side in 22 patients (68%) and on the left side in 10 (32%) evolving for a period of time varying between 02 months and 24 month.

* Recurrent meningitis was observed in 15 cases (47%).

* Disturbances of consciousness in 02 cases (6%).

* A case of loss of smell or anosmia has been reported.

Three patients have been operated on previously for head trauma (depressed frontal fracture) and who were subsequently treated for rhinorrhea by subtractive lumbar punctures.

In 27 patients (84%), we found that the defect is associated with a small post-traumatic meningocele without cerebral hernia in 05 patients (16%) there was a post-traumatic meningo-encephalocele associated with a more or less large osteo-dural defect.

The most frequent localization was the cribriform plate of the ethmoid and the roof of the ethmoid, anterior and posterior in all patients (100%). The width of the defect is variable from one patient to another.

We have found that the defect is more frequent on the right side than on the left.

Immediate postoperative morbidity was marked by the onset of an epileptic seizure in

two patients, partial frontal syndrome in one patient, a frontal mucocele in 04 patients which required surgical revision.

After a long-term follow-up ranging from 1 to 12 years, we resumed two cases of osteo-dural breaches, the results of which is 100% success.

We observed a loss of smell in most of our patients; this anosmia is in report with the lesion of the olfactory nerve's branches on the cribriform plate of the ethmoid.

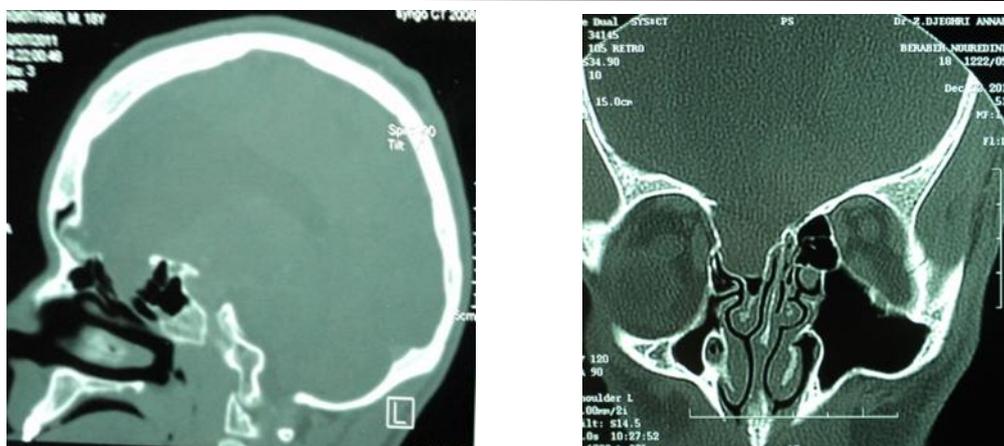


Fig1: a brain CT scan in sagittal and frontal sections which shows the osteo-dural defect at the level of the anterior skull base with opening of the posterior wall of the frontal sinus.

IV. Discussion:

The presence of CSF rhinorrhea implies a breach of the base of the skull with opening of all the barriers that separate the subarachnoid spaces from the upper aero-digestive tract. It occurs in 5% of fractures of the anterior skull base and its incidence increases to 25% in cases of paranasal sinus fracture (9.10.11).

The risk of meningitis secondary to these traumas with rhinorrhea is unpredictable, from 10 to 30% according to different authors and is the cause of severe neurological complications and death despite modern antibiotic therapy (1.2.3.12).

The preferred sites of the CSF fistula are the roofs of the anterior and posterior ethmoid, the olfactory groove, the roof and the lateral wall of the sphenoid sinus and finally the posterior wall of the frontal sinus.

The management of CSF fistula is controversial. It is a common practice to wait for the spontaneous stopping of rhinorrhea (70% dry up after three weeks).

The first successful neurosurgically operated breach was made by Dandy in 1926; the Swedish Dolhman described the first extra cranial approach which was a naso-orbital approach to plug an ethmoidal breach (6).

The first repair of a breach of the sella turcica by trans-rhinio-septal approach was reported in 1952 by the Austrian Hirsch (6).

Vrabec performed the first endonasal approach. Wigand was the pioneer who, in 1981, developed this approach, first under a microscope to close ethmoid-sphenoidal breaches (6).

The relatively high morbidity and failure rate of a transcranial approach has led to the search for another method (13.14.15).

Endoscopic surgery was first developed for the treatment of inflammatory lesions in sinuses, then for pituitary pathology, and then its use was widened for the surgery of the skull base and CSF fistula repair (5.6). This endoscopic technique allows the repair of dural breaches with minimal morbidity and preservation of smell (5.6).

In the literature, several techniques and materials were described in the treatment of fistulas of the CSF including autologous materials such as abdominal fat, nasal septum lining, bone, and fascia lata and muscle grafts (5.6).

The endoscopic technique was spread throughout the world by STAMMBERGER (an ENT surgeon from GRAZ University) (5.6).

In 20 years, endoscopic endonasal repair took the place of the trans-cranial neurosurgery, with a success rates of 85-90% in almost all the published series since 1991 (5.6).

The trans-cranial approach still retains its place in the treatment of osteomeningeal breaches of the anterior level of the skull base in two situations (13.14.15.16.17);

1-it is indicated when the posterior wall of the frontal sinus is open following an external cranial trauma or when the patient has been operated by a frontal or bi-frontal craniotomy with opening of the frontal sinus hence the interest of performing a tomodesitometric examination in sagittal sequences.

2-it is of interest in cases of failure of endoscopic repair for breaches that sits at the level on the anterior level of the skull base.

The surgical procedure consists of performing a bi-frontal craniotomy flush with the two orbital arches, with opening of the frontal sinus when the latter is well pneumatized.

An extra-dural exploration is done on the same side of the rhinorrhea, going up to the visualization of the breach and the bone defect.

The repair is done with a plasty taken from the galea which will be sutured afterwards (13.14.15.16.17).

The success rate of transcranial surgery is estimated at 85-90% of cases in the literature.

The failure rate of this route is closely linked to the size of the breach and its extent, either laterally and especially behind towards the middle level of the base of the skull (13.14.15.16.17).

Postoperative morbidity is greater than that of endoscopic surgery marked by the risk of epilepsy, the appearance of a partial frontal syndrome especially in the event of an excessive spreading of the frontal lobe (13.14.15)

The risk of infection is significant in the short and long term, especially in the event of the opening of the frontal sinus.

Uni or bifrontal mucocele is the most common infectious complication that does not require surgical management (13.14.15).

V. Conclusion:

Secondary cerebrospinal rhinorrhea has an osteomeningeal breach that sits at the level of the cribriform plate and the roof of the ethmoid are managed endoscopically endonasally and with a transcranial approach in case of a post-traumatic opening of the posterior wall of the frontal sinus and in case of endoscopic surgery failure.

It is a surgery with a certain rate of postoperative morbidity, but it remains the only surgical solution in case of failure of endoscopic surgery.

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