

*Research Article***Subfrontal versus Front lateral Approach for Anterior Skull Base Lesions**

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Abstract

Introduction: Anterior skull base lesions represent a special challenge to surgeons due to the complex anatomy of the area. While small lesions are easy to remove, large lesions can pose complex situations. **Aim of the study:** In this study we aim to evaluate the frontolateral approach with eye brow incision as an alternative to the classic unilateral subfrontal approach to anterior skull base lesions. **Patient and Methods:** This study has been performed on 20 patients were admitted at the Department of Neurosurgery of El Minia university Hospital starting from Jan 1st 2016. **Result:** According to our study that performed on 20 patients with anterior skull base lesions that underwent surgical excision via unilateral subfrontal approach in 10 patients and frontolateral approach in 10 patients at our department. **Discussion:** The application of modern and special anesthetic techniques is very essential for good brain relaxation, minimizing brain retraction. **Summary and Conclusions:** Anterior skull base lesions represent a special challenge to surgeons due to the complex anatomy of the area.

Keywords: Anterior skull, hydrocephalus, Front lateral

Introduction

Anterior skull base lesions represent a special challenge to surgeons due to the complex anatomy of the area. While small lesions are easy to remove, large lesions can pose complex situations. The most difficult aspects are not only the approach and removal, but specially the repair of the defects created by the resection of the lesion. (Vanaclocha, et al., 1997)

Anatomically, anterior skull base is bound anteriorly by the frontal bone, inferiorly by the orbital roofs. The foramen cecum is in the midline behind the frontal bone, its posterior and lateral boundaries formed by the ethmoid bone. The crista galli is an osseous ridge arising from the midline of the ethmoid bone. The cribriform plate which is on either side of the crista contains the olfactory foramina through which the anterior and posterior ethmoidal arteries and olfactory nerves travel. The planum sphenoidale and the lesser wing of the sphenoid constitute the posterior floor of the anterior skull base behind the cribriform plate. The blood supply to the anterior skull base is from ICA via the anterior and posterior ethmoidal

arteries and ECA via middle meningeal artery. (Ketan, et al., 2002)

In the area of the skull base, a bony plate separates the intracranial compartment from the extra cranial compartment, and pathologies may arise in this bony separation or in the intracranial compartment or extra cranial compartment, so evaluation with both CT and MRI maybe needed to approach these pathologies. (Rakesh, et al., 2014)

Anterior skull base lesions may be congenital lesions as dermoid cysts, encephalocele and meningocele. Bacterial infections as subdural or epidural empyema, intraparenchymal abscess, cerebritis and meningitis, fungal infection as mucormycosis. Tumors as olfactory groove meningiomas, subfrontal meningiomas, tuberculom sellae meningiomas and chondrosarcoma. (SF Morales, et al., 2014)

Because of increased emphasis on smaller craniotomies tailored to specific pathology, the supraorbital craniotomy has evolved as a result of stepwise modifications to standard subfrontal

approach which involve generous skin and bone flaps. The supraorbital craniotomy is a “keyhole craniotomy” with important strengths and limitations . (R Rossani, et al., 2011)

The goals of the frontolateral approach are to treat neurosurgical lesions using a less-invasive technique, limit brain retraction and tissue trauma by exploiting anatomic corridors, offer comparable safety and efficacy relative to standard approaches, and yield a good cosmetic result. (R Rossani, et al., 2011)

Aim of the study

In this study we aim to evaluate the frontolateral approach with eye brow incision as an alternative to the classic unilateral subfrontal approach to anterior skull base lesions.

Patient and Methods

This study has been performed on 20 patients were admitted at the Department of Neurosurgery of El Minia university Hospital starting from Jan 1st 2016.

Inclusion criteria:

- Patients with anterior skull base lesions.
- Patients fit for surgery.
- Patients who agree to have surgery.

Exclusion criteria:

- Patients with lesions extending beyond anterior skull base.
- Patients unfit for surgery.
- Patients who didn’t agree to have surgery.

Result

According to our study that performed on 20 patients with anterior skull base lesions that underwent surgical excision via unilateral subfrontal approach in 10 patients and frontolateral approach in 10 patients at our department the following are the results:

Age range between 15-65 years:

- Via unilateral subfrontal approach age range between 25-65 years with a median age of 45years
- Via frontolateral approach age range between 15-50 years with a median age of 32.5 years

Sex 10 male and 10 female:

- Via unilateral subfrontal approach 6 males and 4 females
- Via frontolateral approach 4 males and 6 females

Intraoperative complications:

Table: Represent the intraoperative complications

	Subfrontal approach	Frontolateral approach
a) <u>need for retraction:</u>	1 case	3 cases
b) <u>bleeding:</u>	2 case that controlled by bipolar cautery and head elevation with application of fibrillar	3 cases that controlled by local application of fibrillar and surgiflow
c) <u>Tissue trauma:</u> (tough manipulation)	2 cases	1 case

Discussion

The application of modern and special anesthetic techniques is very essential for good brain relaxation, minimizing brain retraction. Nevertheless, the size of the craniotomy is not the aim, but an adequate, comfortable surgical

approach with less brain exposure and minimal retraction is the golden rule.

According to cone theory (The intracranial field widens as the distance increases from the entry point), means that the size of craniotomy plays

no rule with the target lesion, however, the size of the inner field is the most important.

The frontolateral approach as minicraniotomies characterized by smaller, less invasive skin incision (within the eye brow), sparing the temporal muscle, away from the branches of fascial nerve and saving the supraorbital nerve

Other advantages include smaller bone flap, less brain exposure, minimal tissue destruction resulting in decreased possible intraoperative and postoperative complications, less postoperative pain scale and hospital stay with pleasant cosmetic outcome.

So, the unilateral subfrontal approach is equal to the frontolateral approach in the indications of surgery, the exposure of the lesion and the degree of excision of the lesion with a preference of the frontolateral approach in the above mentioned advantages.

The result of our study support this finding
In our study, we evaluate the results of twenty patients (10 males and 10 females) with average age of 40 years old who having anterior skull base lesions (olfactory groove meningioma 9 cases, subfrontal meningioma 4 cases, mucormycosis 4 cases, trauma 2 cases and encephalocele 1 case).

Ten patients underwent surgery via unilateral sub frontal approach (olfactory groove meningioma 3 cases, subfrontal meningioma 2 cases, mucormycosis 3 cases, trauma 1 case and encephalocele 1 case) and ten patients underwent surgery via frontolateral approach (olfactory groove meningioma 6 cases, subfrontal meningioma 2 cases, mucormycosis 1 case and trauma 1 case).

Recommendations:

Most of anterior skull base lesions should be operated via frontolateral approach through supraorbital eyebrow incision as it has short duration of operation, less postoperative complications, less postoperative pain scale, short postoperative hospital stay and pleasant cosmetic outcome.

The frontolateral approach has some limitations, the main limitations is this approach is not suitable for complex skull-base lesions

which are intimately involved with critical neurovascular structures.

Another limitation is the decrease in surgical freedom offered by the frontolateral craniotomy compared to larger, standard approaches such as subfrontal approaches. The concern is that it will be more difficult for the surgeon to manage intraoperative complications. To obtain control, the surgeon may need to alter his surgical trajectory. However, there is little space to accommodate a “third hand” for rapid suction if needed.

The last limitation regards the incision; when it becomes infected the cosmetic result is suboptimal. An infected incision behind the hairline may ultimately yield a better result. Finally, and most importantly, it has been demonstrated definitively that this approach offers improved morbidity when compared to unilateral subfrontal approaches, also it is our impression that patients experience less postoperative pain and have a shorter hospital stay.

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