Craniopharyngioma transcranial surgery

While transcranial surgery (TCS) for craniopharyngioma resection have been applied for many years, there are ongoing efforts to evaluate and improve these approaches to reduce the rates of significant morbidity. Minimally invasive modifications such as the supraorbital approach, with or without endoscopic assistance, have been used for lesions extending into the third ventricle and with significant retrochiasmatic components.

However, the supraorbital approach is limited in its ability to visualize under the ipsilateral optic nerve and into the sella as well as high up into the ventricle. Traditional transcranial approaches are still the mainstay for surgeons unfamiliar with endoscopic skull base surgery.

ESBS facilitates exposure of the tumor without traversing the critical neurovascular structures and has been shown to be associated with decreased morbidity. The ventral approach minimizes optic nerve and brain retraction while exposing not only sellar tumors but also those with suprasellar, third ventricular, and interpeduncular extension. The traditional microscopic approach is limited by a narrow visualized field and the resulting difficulty obtaining a complete resection. The addition of the endoscope has changed the calculus for approaching these tumors ventrally, because wide exposure is afforded through a minimally invasive corridor. Both endoscopic and microscopic ventral approaches remain limited for the removal of tumors with lateral extension beyond the carotid arteries.

see Craniopharyngioma endoscopic endonasal approach.

Approaches

Approach selection is largely dependent on tumor location, extent of pathology, tumor consistency, relationship to the optic chiasm, relationship to the pituitary stalk, involvement of the third ventricle, history and details of prior surgeries, and lastly, the surgeon's preference based on personal experience and comfort. Various authors have classified craniopharyngiomas based on the location, their relationship to the pituitary stalk, or their position along the vertical hypophyseal axis.

A variety of different skull base approaches can be used to access craniopharyngiomas, each with distinct advantages and limitations. Traditional open transcranial approaches include midline approaches (transbasal subfrontal and frontobasal interhemispheric), anterolateral approaches (pterional, orbitopterional, orbitozygomatic, frontolateral, and supraorbital eyebrow), and lateral approaches (combined petrosal and subtemporal).

The minimally invasive anterior interhemispheric approach, with or without opening of the lamina terminalis is useful.

see Anterior interhemispheric approach

Purely intraventricular craniopharyngiomas situated in the third ventricle and/or lateral ventricles may be better accessed with transcortical or transcallosal interhemispheric approach intraventricular approaches.

Usually via large right frontotemporal flap as low as possible along base of frontal fossa (lateral sphenoid wing rongeured/drilled). Approach to tumor is extraaxial, whether subfrontal or
frontotemporal. All tumors should be aspirated (even if they appear solid radiographically). Then, with microscope, possible approaches include:

1. **subchiasmatic**: through space between optic nerves and anterior to chiasm. It was thought that a "prefixed chiasm" (i.e. congenitally short optic nerves with chiasm unusually close to the planum sphenoidale) was more common in patients with CP, making this approach more difficult. However, in reality the chiasm is probably bowed anteriorly by the tumor within the third ventricle giving the illusion of a prefixed chiasm in most cases.

2. **opticocarotid** (between right ICA and right optic nerve/optic tract).

3. **lamina terminalis** (tumor often needs to be brought down and removed subchiasmatically).

4. lateral to internal carotid artery

5. transfrontal-transsphenoidal: drill off tuberculum sellae.

Alternative approaches to frontotemporal

1. pure transsphenoidal: if dark fluid is aspirated with no CSF evident, it is possible to leave a stent from the tumor cavity to the sphenoid air-sinus to permit continued drainage

2. transcallosal interhemispheric approach: strictly for tumors limited to the third ventricle

3. a combined subfrontal/pterional approach capitalizes on the advantages of each (head is positioned with slight lateral rotation)

Spare the following structures: small arterial feeders to undersurface of the chiasm (major supply) and tract; at least a remnant of pituitary stalk (recognized by unique pattern of longitudinal striations which are the long portal veins) of the Hypophyseal portal system. If the tumor easily pulls down from above then this is permissible, however do not pull too hard or else hypothalamic injury may result.

**Post-op**

1. steroids: these patients are all considered hypo-adrenal. Give hydrocortisone in physiologic doses (for mineralocorticoid activity) in addition to dexamethasone (glucocorticoid that treats edema) taper. Taper steroids slowly to avoid aseptic (chemical) meningitis

2. diabetes insipidus (DI): often shows up early. May be part of a “triphasic response.” Best managed initially with fluid replacement. If necessary, use short acting vasopressin (prevents iatrogenic renal shutdown if a SIADH-like phase develops during vasopressin therapy)

**Case reports**

In a video, Aldave et al., presented a case of a 6-yr-old girl with a large sellar-suprasellar craniopharyngioma. The fact that the sphenoid was not pneumatized and the chiasm was elevated 1.2 cm from the planum sphenoidale were some of the reasons to choose a subfrontal infrachiasmatic approach as we discuss and we show in the video. This approach has not been very well established in the literature but we demonstrate it can become a good alternative for a particular type of sellar-suprasellar tumors. Appropriate video authorization consent was obtained from the parent of the
patient 4).


