

Adult craniopharyngioma

Clinical, radiological presentation and outcome of management

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ABSTRACT

Objectives: The objective of this study was to ascertain the patterns of clinical and radiological presentation and the outcome of management of adult patients with craniopharyngioma (CRF).

Methods: A retrospective review of adult patients (18 years) with CRF treated at King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia during the period January 1990 to December 2001. Fifteen children with CRF were excluded from the study.

Results: There were 11 patients, 6 females (54.5%), and 5 males (45.5%); the mean age was 33.7 years (median 31). The main presenting symptoms were reduced vision in 82%, symptoms of raised intracranial pressure (ICP) in 36.4%, endocrinal problems in 36.4%, seizures in 9%, and hemiparesis in 9%. Radiological studies showed 72.7% of tumors had mixed solid and

cystic components, calcification in all tumors, and ventricular dilatation in 3 patients, with 2 of them (18.2%) having ventriculo-peritoneal shunt. Eighty-two percent of patients had tumor excision through pterional craniotomy and 18% through subfrontal approach. Gross total removal was achieved in 3 patients (27.3%), and subtotal resection in 72.7%. Tumor recurred in 4 patients (36.4%). The outcome was good in 8 patients (72.7%); poor in one patient (9%), and 2 patients died (18%).

Conclusion: Adult patients with CRF had better surgical outcome than children, therefore, total resection of the tumor should be the goal of treatment as it offers the best chance of cure; however, it should not be at the expense of severe functional disability.

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Craniopharyngioma (CRF) has long been known to be among the foremost challenges in neurosurgery. It has challenged neurosurgeons since its initial description, and the first attempts at surgical removal 7 years later.^{1,2} Craniopharyngioma was initially called tumor of the Rathke's pouch,¹ it has also been named intracystic papilloma or hypophyseal duct tumors. Later, they were classified as the most forbidding of the intracranial tumors.^{1,2} It arises from epithelial rests (remnants of Rathke's pouch) located on an axis extending from

the sella turcica along the pituitary stalk to the hypothalamus and the floor of the third ventricle.^{1,2} Although benign, there are scarce reports of squamous cell carcinoma arising in a previously benign CRF; radiotherapy has been a contributing factor to the carcinogenesis in some cases.³ Microscopically; CRF are composed of nests or trabeculae of epithelial cells, epithelial-lined cysts, or both, embedded in a loose connective tissue or glial stroma. Two different histological types of CRF are recognized; adamantinomatous (common

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type) that occurs more often in children, usually with calcification, which frequently invades the brain and can recur. The other type is the squamous papillary CRF that occurs almost exclusively in adults, rarely calcifies, and does not invade the brain or recur.^{4,5} Mixed CRF showing features of both types is well described. The initial presentation of CRF in adults is characterized by insidious loss of vision and endocrine disturbances, manifestations of raised intracranial pressure (ICP), or both. Acute presentation in the form of altered sensorium and focal neurological deficits is less common. Although benign, the treatment paradigms of CRF remain controversial. It includes biopsy, aggressive surgical resection, radiotherapy and multimodality approaches. Surgical treatment is commonly associated with substantial morbidity in the form of hypothalamic and endocrinal insufficiency, reduced vision as well as tumor recurrence which is considered a major long term problem in the management of CRF.⁶

Methods. The study included 11 consecutive adult patients (18 years or above) with CRF treated at King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia during the period from January 1990 to December 2001. Fifteen children with CRF were excluded from the study. The patient files were reviewed and all demographic, clinical, radiological and treatment data were collected according to a previously designed data sheet. The following data were collected: patient's age, sex, duration of illness, and the presenting symptoms such as; loss of vision, endocrinal disturbances, manifestations of raised ICP, seizures, hemiparesis or both. The physical signs documented in the notes were recorded including visual acuity and fields, presence of optic atrophy on fundus examination, Serum hormones (thyroxin, cortisol, growth hormone, follicle stimulating hormone and leuteinizing hormone) were also recorded if available. The radiological findings from plain x-rays, CT and MRI scans, such as; large sella turcica, presence of calcification, appearance of tumor (cystic or solid), location of the tumor (prechiasmatic or retrochiasmatic), tumor extension beyond the supra- and para-sellar regions, as well as hydrocephalus was also recorded; **Figures 1-3.** Operative data were documented including the surgical approach (pterional, subfrontal, transcallosal, or trans-sphenoid), and the amount of tumor excision whether subtotal resection (STR) or gross total removal (GTR), **Figures 4 & 5.** Postoperative treatment with radiotherapy was also recorded. Tumor recurrence was defined as regrowth of tumor after a period of quiescence (in case of STR) as appeared in the follow up CT, MRI scans or both. Follow up notes were reviewed and the patient's clinical, endocrinological and radiological findings were documented. The

outcome of treatment was considered good (if the patient is alive, with stable useful vision, and can cope with his job, poor (if not fulfilling the above criteria), and dead.⁷ Data were analyzed using the Statistical Package for Social Sciences version 9. We calculated the frequencies including the mean, median and mode for the different variables.

Results. The study included 11 patients of whom 6 patients (54.5%) were Saudi. Six patients (54.5%) were females and 5 (45.5%) were males; the male to female ratio was 1:1.2. The age ranged from 19-55 years with a median age of 31 years (mean 33.7). The duration of symptoms ranged from one month to 7 years with a median of 24 months. **Tables 1 & 2** summarize the clinical and radiological features of the patients. The pterional approach was used in 9 (82%) patients and the subfrontal approach in the remaining 2. One patient initially had trans-sphenoid drainage of a cystic CRF and 6 months later he developed tumor recurrence that was treated through a pterional approach. Gross total resection of the tumor was achieved in 3 patients (27.3%) and 8 patients (72.7%) had STR. Early postoperative complications included; transient hemiparesis in one patient (9%), persistent hydrocephalus (required ventriculo-peritoneal shunt) in 2 patients. All patients required hormone replacement (DDAVP in 7 patients, hydrocortisone and thyroxin in all patients). Tumor recurrence was detected in 3 patients (27%), one of them received postoperative radiotherapy, and the mean duration of recurrence was 22 months. The follow up period ranged from 1-10 years (median 36 months). The outcome was good in 8 patients (73%), poor in one patient (9%), and 2 patients died (18%); the first patient died 2 days after surgery from an acute and severe form of hypothalamic dysfunction following GTR of the tumor. The 2nd patient died one and half years after surgery from persistent hypothalamic dysfunction.

Discussion. There is a false belief that CRF is a childhood tumor, approximately 50% of CRF's occur in adult patients (18 years or above), and some cases are reported in elderly people up to 70 years of age.^{2,4,7} It has equal sex distribution.^{2,4} In the present study, the mean age of patients was 33.7 years which is considered the most active and productive period of human's life. Tumors invading the pituitary gland and the hypothalamus such as CRF usually cause significant disability to the patient including his vision, general activity, and fertility. Regarding the clinical presentation of CRF, loss of vision was as usual the most frequent presentation; 9 out of 11 patients (82%). In our study the loss of vision was apparently higher than that reported in the literature, this could be attributed to 2 factors; first is due to delay in patient



Figure 1 - Non-contrast CT brain scan showing the tumor with calcification in the third ventricle region.

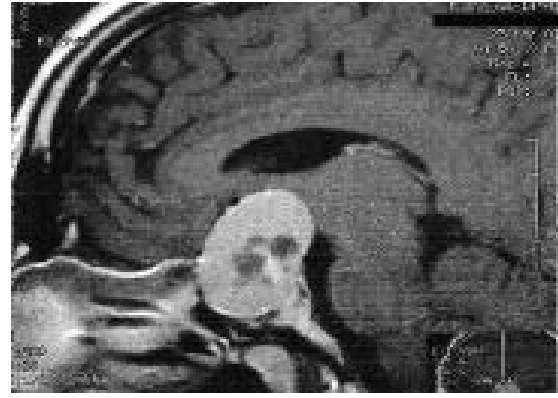


Figure 2 - Magnetic resonance image scan, sagittal T1 post contrast image, clearly demarcating the location, and extension of the tumor.



Figure 3 - Magnetic resonance scan, coronal T2 image showing the mixed density nature of the tumor as well as the tumor-brain interface, displacement of the third ventricle and its relation with the carotid arteries.

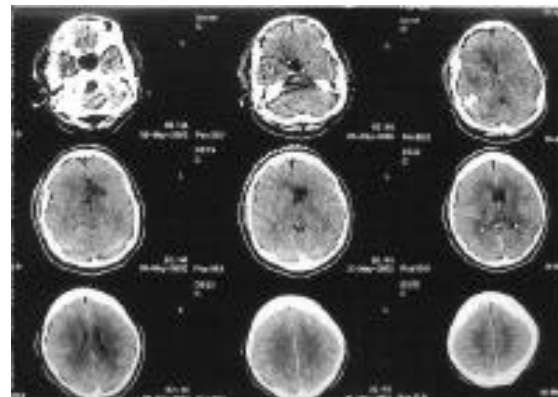


Figure 4 - Postoperative CT scan showing complete excision (GTR) of the tumor. GTR - gross total removal

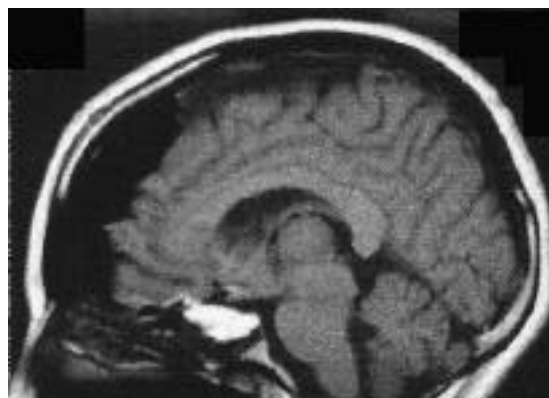


Figure 5 - Postoperative MRI scan, T1 sagittal image with contrast showing GTR of the tumor. GTR - gross total removal

Table 1 - Clinical features at presentation.

Clinical features	n (%)
Reduced Vision	9 (82)
Unilateral	2 (18.2)
Bilateral	7 (63.6)
Optic atrophy	9 (82.8)
Papilledema	2 (18.2)
Raised ICP	4 (36.4)
Endocrinal disturbances*	4 (36.4)
Seizures	1 (9)
Hemiparesis	1 (9)
ICP - intracranial pressure *One patient had infertility and diminished libido, and 4 had reduced thyroxine and cortisol	

Table 2 - Radiological findings on CT and MRI scans.

Radiological features	n (%)
Pre-chiasmatic	7 (63.6)
Retro-chiasmatic	4 (36.4)
Calcification	11 (100)
Cystic only	2 (18.2)
Solid only	1 (9)
Mixed solid & cystic	8 (72.7)
Dilated ventricles*	2 (18.2)
*One patient required ventriculo-peritoneal shunts after tumor excision	

presentation to the neurosurgery service and the second is that 7 patients (64%) had large tumors (> 4 cm in maximal diameter) in the prechiasmatic region. Yasargil⁷ attributed the visual deterioration to 2 factors, the first is due to stretching of the optic nerves by the underlying tumor against the tough dura of the optic canal, and the second is the pincer action on the chiasm (being pushed from below by the tumor against the anterior cerebral arteries crossing over the optic chiasm).

Details of the type, location, adhesiveness, and extension of the tumor are essential for planning surgical removal of a craniopharyngioma.⁸ The preoperative radiology should include MRI and CT scans, plain x-rays of the skull and preferably cerebral angiogram or magnetic resonance arteriography. A CT scan was carried out in all cases included in our study and it has clearly shown the nature of the lesion (solid or cystic) as well as calcification in all patients. The contrast enhanced scans clearly showed the solid portion of the tumor as well as the cyst wall. The preoperative diagnosis of our cases was based primarily on the CT findings. In 1998 MRI scanning was introduced to our institute and since then all patients with brain tumors have had MRI scans before surgery. The T2 axial views as well as T1 contrast enhanced coronal, and sagittal views showed the exact extension of the tumor and its relation to the surrounding arteries as well as the tumor-brain interface.

Although a benign neoplasm, CRF has an aggressive course and still represents a formidable challenge to neurosurgeons and cure is difficult to achieve. Despite the advances in diagnosis and treatment, no single mode of treatment has proved to be uniformly satisfactory. Most neurosurgeons⁸⁻¹² agree that total removal of CRF is the best modality of treatment and offers the best chance of good outcome in terms of survival and quality of life for

both adults and children; however, the long term tumor control should not be at the expense of a severe functional disability. The subfrontal, pterional, transcallosal, and trans-sphenoidal approaches are well described in the literature for surgical excision of CRF. The pterional approach was found adequate in most of our cases. By splitting the Sylvian fissure widely, most tumors were fully exposed and in cases where the tumor has extended up into the third ventricle, opening the lamina terminalis was used to access them.

Gross total removal was achieved in 3 patients (27.3%) as confirmed by postoperative imaging. In the rest of the patients, it was felt by the operating surgeon that total removal was hazardous and it was risky to dissect the tumor off the surrounding arteries and optic pathways, and its capsule was adherent to the hypothalamus. Although 6 patients had STR, only 3 had postoperative radiotherapy, the reasons for not giving radiotherapy to the remaining 3 were in 2 patients the residual tumor was mostly calcified and we preferred to watch the patients before referring them for radiotherapy, and in the third one it was thought that we achieved GTR. The outcome of treatment of CRF is well described in the literature, however, there are wide variations. Reports of good results range from 60-85%, and a large series reported mortality rates of 5-10%.¹¹⁻¹⁵ In Yasargil's series, considered as the largest personal series in the literature, the long-term (20 years) survival was 90% after primary surgery and 60% after re-operation, and the recurrence rate in his series was 7% after complete removal (lowest reported recurrence rate).¹⁶ Choux et al,¹⁷ in the multi-centre study of 474 children, reported 3.7% surgical mortality for primary surgery and 13% after secondary radical surgery.¹⁷ Although CRF's are radiosensitive tumors, there is a general agreement, not to give postoperative radiotherapy after total

tumor removal confirmed by imaging.¹³⁻¹⁷ A small fleck of calcification without enhancing tumor was considered as total resection.¹⁰ Reports of outcome of management of CRF in adult patients are encouraging, the percentage of good outcome is reported as high as 85%.^{11,16,17} Seventy-two percent of patients in this study had good outcome, while 9% had poor outcome, and the mortality rate was 18% (2 patients). Previously, we had reported 28% good outcome for children.¹⁸ The explanation for the better outcome in adults is that tumor recurrence is more common in children (75% versus 25% in our series), it is well documented that once recurrence occurs, the course of the disease changes dramatically and progressively, in addition radiotherapy is better tolerated by adults than children, and adults often had long-lasting benefit from combined surgery and radiotherapy.^{10,12-14,17}

The recurrence rate in CRF ranges from 10-90%.^{2-4,9-11,15,17,19} It depends mainly on the amount of resection, which is determined by the surgeon's judgment during surgery and whether postoperative radiotherapy was given or not. For surgery alone without postoperative radiotherapy, the reported recurrence rate is 7-25% after GTR confirmed by postoperative imaging. Hoffman,¹² reported a 34% recurrence rate in patients he felt had complete resection. Recurrence is unavoidable after STR alone without radiotherapy; usually it occurs after a short period of tumor quiescence.^{11,17,19} Choux reported a recurrence rate of 19% after GTR, 30% after STR followed by radiotherapy, and 57% after STR alone (30% overall recurrence rate).¹⁷ Wara et al¹⁹ reported a 95% 5-year survival after STR and radiotherapy, and 78% at 15 years. However, they did not comment on the quality of survival in their series.¹⁹ Four of our patients (36.4%) developed recurrence, all had STR but only 3 of them had postoperative radiotherapy because of the previously mentioned reasons. The hazards of radiotherapy especially in children are described in detail in the literature; it includes cognitive impairment, secondary tumors, Moya Moya vasculitis, panhypopituitarism, and cranial nerve neuropathy and radiation necrosis of the brain. From this series which includes patients from different regions of KSA, we could see that there was significant delay in referring patients for treatment (82% had significant deterioration of their vision).

In conclusion, CRF occurs in adults as frequently as in children, the main presenting feature in adults is usually visual disturbance. The outcome of surgery is better in adults than in children, therefore, total resection of the tumor should be the goal of treatment as it offers the best chances of cure, however, it should not be at the expense of the quality of patient's life after surgery.

Postoperatively, patients need close follow up monitoring by multiple disciplines mainly neuro-ophthalmology and neuro-endocrinology.

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