DIFFERENT MODALITIES FOR THE TREATMENT OF NASO-ETHMOIDAL TUMORS INVOLVING THE ANTERIOR SKULL BASE

Mohamed S. Rifai; Amr H. El-Senbawy; Tarek A.Omran, Ezz Eddin G. EL sheikh; Tarek A. Emara and Alaa O. Khazbak

Otorhinolaryngology Department

Faculty of Medicine, Zagazig University

ABSTRACT

Background: opened Craniofacial resection has been considered the gold standard in the management of malignancies involving the anterior skull base(ASB). In recent years, there has been growing enthusiasm for purely endoscopic techniques for craniofacial malignancies. **Aim of the work:** To evaluate the modalities in the management of nasoethmoidal tumors invading the (ASB). **Patients and methods:** The study was carried out on ten patients with naso-ethmoidal tumors invading the (ASB). The patients were classified into two groups; group(A) and group(B). Group (A) included five patients were subjected to traditional craniofacial resection (TCFR) and group (B) included five patients who had endoscopic craniofacial resection (ECFR). Postoperative radiotherapy or chemo radiotherapy was planned according to the tumor pathology and staging . The follow up period ranged from 12 to 30 months **Results:** The most common presenting symptoms of the patients were nasal obstruction, epistaxis and proptosis. The commonest histopathological findings of the tumor were olfactory neuroblastoma, squamous cell carcinoma. In group (A) the post operative complications were encountered in two patients in the form of wound infection and C.N.S complications while In group (B) the post operative complications were encountered in one patient in the form of C.S.F leak. In group(A), three patients had a complete tumor eradication and one patient had a local recurrence while in group (B),three patients had a complete eradication of the tumor and two patients had a local recurrence. There was one case of mortality in group (A). **Conclusion:** ECFR may reduce the surgery related morbidity and mortality. However, it has a higher local recurrence rate when compared to that of TCFR outcome. It should be considered as an alternative treatment option for selected sinonasal tumors involving the (ASB).

Keywords: anterior skull base, craniofacial resection, malignancies

INTRODUCTION

Naso-ethmoidal tumors involving the anterior skull base(ASB) are challenging due to the complex anatomy and important structures that may be involved. Several surgical techniques for approaching this area have been developed for complete resection of these tumors[(1)].

The use of different modalities in managing these tumors usually related to the histological and the clinical features of the tumors[(2)].

Anterior craniofacial resection was introduced by Ketcham in (1963). This approach is performed via a bifrontal craniotomy combined with a transfacial approach. However, a new technique was needed because of the high rate of surgical complications and morbidity associated with the current approach.[(3)].

Endoscopic resection of sinonasal tumors invading the anterior skull base had been reported by Devaiah et al. who underwent cranio-endoscopic resection with avoidance of osteotomies of the face and so minimize the postoperative morbidity .[(4)].

The use of different approaches for different tumors in these critical cases usually gives variable morbidity and surgical outcome. The goal of this study is to evaluate different modalities in the treatment of the naso-ethmoidal tumors invading the anterior skull base.

PATIENTS AND METHODS

This study was carried on 10 patients presented with naso-ethmoidal tumors invading the (ASB). All patients were subjected to adequate history taking, complete general and local examination including otorhinolaryngological, neurological and ocular examination, complete radiological assessment including C.T and M.R.I evaluation, biopsy taking, complete preoperative investigations and metastatic work up. The patients were 6 males and 4 females, and their ages ranged between 5 and 65 years . They were classified according to the tumor size ,degree of the skull base invasion and the orbital invasion into two groups; group (A) and group(B). Group (A) included five patients were subjected to open craniofacial resection and Group (B) included five patients whom had endoscopic craniofacial resection.

Exclusion criteria for group(B) were; extensive orbital invasion, extension to the anterior wall of the frontal sinus, hard palate invasion, walls of the maxillary sinus and extension to the subcutaneous tissue.

Surgical technique for group A:

The classic combined craniofacial resection was used which incorporates a combination of transcranial and transfacial incisions . A transcranial incision was done through a bicoronal incision running 4–5 cm behind the hairline. . A

large flap of pericranial tissue was created for later reconstruction. As the dissection proceeds the brows, the supraorbital and the supratrochlear neurovascular bundles were exposed and preserved. The anterior cranial fossa was then exposed by removing a segment of bone. The lower horizontal bone cut should be kept low to lessen the need for subsequent brain retraction. The dura was then carefully dissected off the crista galli and cribriform plate dividing the dural sleeves that extend along the olfactory nerves. The intracranial portion of the tumor extension is then assessed.

The transfacial incision done through either one of the following incisions; The Lateral rhinotomy or weber Fergusson incision. Three patients were subjected to lateral rhinotomy incision and two patients were subjected to Weber-Fergusson incision.

The osteotomies for tumor resection are dictated in each case by tumor location and extent of involvement. Most commonly, bone cuts were made from the planum sphenoidale along the roof of the ethmoid to the front of the cribriform plate up to and through the frontonasal ducts . They may also involve the orbital wall and portions of the sphenoid sinus. At this point, excellent exposure from both the facial and intracranial approaches was achieved, and osteotomies may be carried out safely .

Reconstruction:

If the skull base defect was greater than 2 cm, a pericranial flap or temporalis muscle flap should be placed over the dura and then skin grafted on the nasal side. Reconstruction of the skull base is begun with watertight closure of the dural defect. The frontal sinus is cranialized, With resection of its posterior wall, the galeal pericranial flap is used to separate the intracranial contents from the sinuses. The flap is sutured in place by anchoring it to the periphery of bony defect. The pericranial flap is harvested by a standard bicoronal incision, and then a scalp flap is elevated in the subgaleal plane to the level of the supraorbital rims. The pericranium is incised and the dissection carried forward in this plane preserving the blood supply from the supraorbital and supratrochlear arteries.

The pericranial flap is rotated through the craniotomy .It may be sutured to the posterior remnant of dura if a portion of dura has been resected or it may be secured by wedging it between the dura and bone with piece of gelfoam. When a significantly larger defect is present, then a bulky muscle flap needs to be placed especially if orbital exenteration or a significant facial skin has been excised. Temporalis muscle free flap may be used. Its fascial attachment to the zygomatic arch is divided,but its attachment to the coronoid process is preserved to protect the blood supply. When the tumor involves the maxillary sinus, the orbit and the infratemporal fossa ,an infratemporal approach is used . We used the pectoralis myocutaneus flap for reconstruction in one patient who had a tumor invasion to the orbit and the skin over the check.

Endoscopic technique for group B:

We begun with depulking of the tumor or with exentration of the anterior paranasal sinuses. Medial maxillectomy was done up to the sphenopalatine foramen. Bilateral frontal sinusotomies were performed with removal of the floor bilaterally. The nasal septum was transected inferior to the area of tumor involvement from the frontal sinus to the rostrum of the sphenoid bone. The tumor was devascularized by sacrifice of the ethmoidal arteries bilaterally. At this point of the surgery, the skull base from orbit to orbit and from frontal sinus to sella turcica, as well as the base of the tumor, is completely exposed, and we are ready to proceed with the resection. A horizontal osteotomy is made at the planum sphenoidale, parallel and anterior to the sphenoid rostrum. Another horizontal osteotomy is made just posterior to the frontal sinus posterior wall. These osteotomies are then connected by bilateral osteotomies performed lateral to the cribriform plate and running parallel to the superomedial wall of the orbits, forming a rectangle that surrounds the tumor and adjacent structures. The olfactory nerves are identified and transected . If the tumor extends to the dura, its anterior surface is coagulated and incised. Dural incisions that match the previously described osteotomies facilitate the removal of the specimen with adequate control of the dural margins.

Reconstruction:

For a smaller defect, an intranasal mucoperichondrial graft is placed firmly around the margins of the skull base defect. Two parallel incisions are performed; one over the maxillary crest and the other 1-2 cm below the most superior aspect of the septum and joined anteriorly by a vertical incision. At the posterior septum, the superior incision is extended laterally over the sphenoid rostrum crossing it horizontally . The inferior incision is extended superiorly along the free posterior edge of the nasal septum and then laterally to cross the posterior choana. Elevation starts anteriorly till the anterior face of the sphenoid sinus . For a larger defect, fascia lata may be obtained for closure of the defect. . The mucosal graft is held tightly in place with absorbable gelatin sponge and Merocel tampons.

In our study 4 patients had a mucoperichondrial graft and only one patient had a fascia lata graft.

RESULTS

The patient presentation most commonly included a history of nasal obstruction (40%), epistaxis (40%), proptosis(40%), and headache(30%),

The histopathological findings of the tumors were olfactory neuroblastoma (30%), squamous cell carcinoma (30%), adenocarcinoma (10%), adenoid cystic carcinoma (10%),chondrosarcoma(10%) and fibrosarcoma (10%)

In group (A), reconstruction was required in all cases in which three patients were reconstructed by a pericranial flap, one patient by temporalis myocutaneus flap and one patient by pectoralis major myocutaneous flap (figures 1 and 2).

In group B, four patients were reconstructed by a nasoseptal graft and one patient needed a fascia lata graft.

In group(A), the mean operative time was 5 hours between (4-6) hours. while in group (B) ,the mean operative time was 3 hours between(2-4) hours.

In group(A), the intraoperative blood loss was more than that of patients in group(B) . All patients in group (A) needed an intraoperative blood transfusion with an average of 2 units of blood and one unit of plasma ,while in group (B) only one patient needed a blood transfusion in the form of one unit of blood.

In group (A),all patients were admitted to the ICU after the operation with the average duration of 4 days(2-10 days) while in group (B) only one patient was admitted to the ICU for only two days

The mean postoperative hospital stay duration for group (A) was 15 days and in for group (B) was 7 days.

In group (A), a post operative complications were encountered in two patients in the form of wound infection and C.N.S complication in the form of epileptic fits, pneumocephalus and brain infarction while In group (B) a postoperative complications were encountered in one patient in the form of C.S.F leak. There was one case of mortality in group (A) died due to massive frontoparietal brain infarction three weeks after the operation.

In group(A), two patients had a postoperative radiotherapy and one patient had a postoperative chemoradiotherapy. while in group (B) four patients had a postoperative radiotherapy and one patient received a radiochemotherapy

In group(A), three patients had a complete tumor eradication and one patient had a local recurrence while in group (B),three patients had a complete eradication of the tumor and two patients had a local recurrence. The follow up period ranged from 12 to 30 months with a mean of 18 months.

Table (1): Incidence of the involved sites with sinonasal tumors in the study (No =10Pts.).

Involved site	Group (A)	Group(B)	%of total No.of pts.
Nasal cavity	5	5	100%
Ethmoid sinuses	5	5	100%
Cribriform plate	5	5	100%
Maxillary sinus	2	2	40%
Frontal lobe	2	1	30%
Sphenoid sinus	1	1	20%
Orbit	2	0	20%
Frontal sinus	1	1	20%

A 

B 

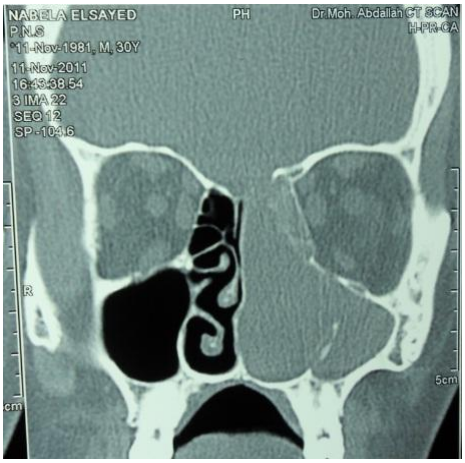
Figure (1): A-Tumor invasion to the orbit, B-Reconstruction with temporalis muscle flap

A **B**

C

Figure (2): A-showing tumor invasion to the skin& orbit.
B-resection of the tumor with orbital exenteration and removal of the involved skin, C-reconstruction of the defect by pectoralis myocutaneus flap.

A



B

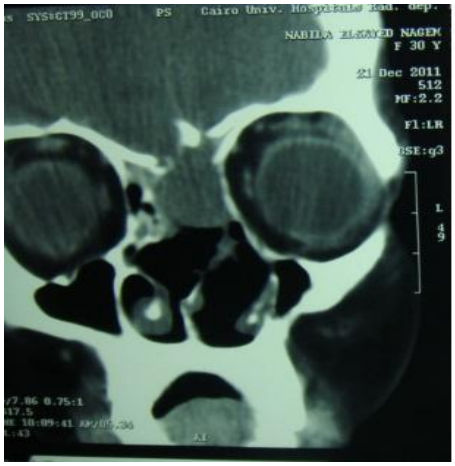


Figure (3): Female patient (30ys) with olfactory neuroblastoma.(A) coronal C.T showing tumor extension.(B) coronal C.T six months postoperative with no recurrence

A

B

Figure (4): Male patient 41ys with olfactory neuroblastoma.(A) preoperative T1 weighted M.R.I showing tumor extension. (B) postoperative T2 weighted M.R.I after eighteen months with no recurrence.

DISCUSSION

Tumors of the sinonasal tract comprise approximately 3% of the tumors that arise in the upper aerodigestive tract. Approximately 10% of tumors that arise in the sinonasal tract originate in the ethmoidal and/or frontal sinuses and are likely to involve the anterior cranial base[(5)].

The sinonasal area offers the greatest range of histological diversity in the body, and the biologic nature of these tumors necessitates a surgical excision in most cases [(6)].

The standard treatment may vary according to the histopathological type of the tumor[(2)].

Every surgical approach to resect sinonasal tract malignancy in the skull base should meet oncologic, functional, and cosmetic requirements. Oncologically, the approach should provide an adequate exposure of the lesion, allowing a complete extirpation. The surgical approach should avoid or correct functional deficits of the brain, orbit, or cranial nerves.

Secondary goals, such as cosmoses, postsurgical pain, duration of hospitalization, and quality of life assume greater importance if oncologic outcomes are comparable[(7)].

Craniofacial resection followed by radiotherapy was considered the gold standard in the treatment of malignancies of the sinonasal tract invading the anterior skull base. However, there has been growing enthusiasm for purely endoscopic techniques for resection of craniofacial malignancies[(8)].

The combined craniofacial approach to the anterior skull base permits complete excision of many malignant tumors of the paranasal sinuses. It is believed that such a technique is associated with maximum survival[(9)].

The endoscopic approach can either be used for a curative (as the only procedure, or as a part of combined treatments, including chemo radiotherapy and craniotomy procedures) or palliative purposes. The various treatment options depend on the histological evaluation, as well as the extent and degree of the tumor spread[(10)].

By working through a natural corridor, endonasal approaches provide direct access to cranial-base pathology without the need for soft-tissue manipulation, skeletal disassembly, and brain retraction. These advantages have facilitated the application of endoscopy to benign sinonasal tumors, However, with more extensive pathology, endoscopy is anatomically limited in its lateral extent by critical neurovascular structures, such as the optic nerve and carotid artery[(11)].

The development of adjuvant therapy has supplemented the limitations of endoscopic resection and allows for a more expanded use of endoscopy with other histopathological tumor types[(12)].

Our study was conducted on 10 patients having a naso-ethmoidal tumors invading the anterior skull base. 5 patients (group A) were operated by opened craniofacial resection and the other 5 patients (group B) were operated by endoscopic craniofacial resection.

In our study, there was a male predominance as the male to female ratio was 3:2 in which males represented 60% and females represented 40% of the study. This is consistent with the results obtained by **Wellman et al.**[(13)] in which the male to female ratio was of 3:2 . These results were different from the results of **Carrau et al.**[(14)], who reported that the male represented 45% of the study and female represented 55% in a ratio of 0.9:1.1.

Regarding the histopathological type of the tumor, in our study ,squamous cell carcinoma and olfactory neuroblastoma were the most common type with a ratio of (30%) for each type. These results were consistent with the results of **Raza et**

al.[15] who stated that olfactory neuroblastoma was the most common pathology (29%), followed by squamous cell carcinoma (27%)**.** These results were different from **Patel et al.**[16] who founded that adenocarcinoma represented(16,1%) followed by olfactory neuroblastoma (11,6%).

With respect to the most common involved site, we found that the sites commonly involved included the nasal cavity (100%), ethmoid sinuses (100%), cribriform plate(100%), maxilla(40%), the orbit(30%), sphenoid sinus(30%), and the frontal lobe (20%) (Table 1). These results were in accord with **Varsheny et al.**[5] who found that the most common sites were the nasal cavity(27,77%), ethmoid sinus (22,22), maxilla(16,7%) and the orbit(5,5%).

The mean total operative time in our study was 5 hours between (4-6) hours in group (A).while in group (B) ,the mean operative time was 3 hours between(2-4) hours. These results were in consistent with **Kim et al.**[2] as they found that the operative time for patients whom were subjected to TCFR (average 13 hs) was longer than that of patients whom were subjected to ECFR (average 8.9 hs). Also these results were in accord with **Jardeleza et al.**[17] in a study on 10 patients with sinonasal adenocarcinoma invading the anterior skull base managed endoscopically as they stated that the mean total operative time was 3 hours and 50 minutes .

In our study, patients whom were subjected to ECFR had a shortened length of the hospital stay with the average of(7) days in comparison to those subjected to TCFR(15)days. This is consistent with **Kim et al.**[2] who reported that the ECFR group had a shortened length of stay (15)days in comparison to the TCFR group with an average of 20 days.

Three complications were encountered in our study which were related to the surgery. These complications were pneumocephalus, wound infection and C S F rhinorrhea. The overall percentage of complications was (30%).

Deschler et al.[18] recorded a rate of complications of (40%).In another study, **Shah et al.**[19]**.**reported that complications occurred in 28 out of 71 (39%) patients**.** Similarly , the complication rate according to **Suarez et al.**[20] was (35,1) .

In our study, two patients In group(A) had a postoperative radiotherapy and one patient with adenoid cystic carcinoma had a postoperative chemo radiotherapy. while in group (B) four patients had a postoperative radiotherapy and one patient with fibrosarcoma had a radio chemotherapy.

In the study of **Jardeleza et al.**[17] All but one patient received postoperative radiation therapy (9 xrt alone, 1 chemoradiation)

In the study of **Varsheny et al.**[5], thirteen of 15 patients with malignant neoplasms received radiotherapy after surgery whereas, 2 were treated with surgery alone.

The overall recurrence in our study was (30%) in which the local recurrence was detected in group (A) in one patient(20%) with adenoid cystic carcinoma which recurred after six months . While in group(B) local recurrence occurred in two patients(40%). The first one was with SCC in which recurrence was detected after one year which was inoperable due to bilateral orbital extension, the other patient with a fibrosarcoma in which recurrence observed after eight months ,Also she was inoperable due to the massive intracranial involvement.

Stammberger et al.[21] reported on eight patients who underwent endoscopic resection of olfactory neuroblastoma. All eight were free of disease with a mean follow up of 37 months**.** **Casiano et al.**[22] reported on a series of five patients with olfactory neuroblastoma with Kadish stage A or B , that were treated endoscopically . With a mean follow up of 31 months following surgery and radiation therapy, there were no local recurrences.

Buchman et al.[1] in a retrospective study on 87 patients with ASB/paranasal malignancies reported that 27 patients (35%) had recurrence after TCFR. There were 15(58%) recurrence at the primary site. Neck recurrence in eight patients (31%) and distant metastasis occurred in three patients(12%).

Carrau et al.[14] in a study on 20 patients with sinonasal malignancy invading the ASB. The postoperative outcome entailed 19 patients alive without recurrence and . One patient with sinonasal undifferentiated carcinoma died of local disease 8 months after surgery.

CONCLUSION

Endoscopic craniofacial resection may have the advantage of reducing the surgery related morbidity and mortality compared to the TCFR , However, it has a higher local recurrence rate when compared to that of TCFR outcome. Therefore , it should be considered as an alternative treatment option for selected naso-ethmoidal tumors involving the anterior skull base.

REFERENCES

1- **Buchmann** L, Larsen C, Pollack A, et al. Endoscopic techniques in resection of anterior skull base/paranasal sinus malignancies. Laryngoscope 2006; 116(10): 1749-54.

2- Kim B, Kim D, Kim S, et al. Endoscopic versus traditional craniofacial resection for patients with sinonasal tumors involving the anterior skull base. Clin Exp Otorhinolaryngol 2008; 1(13): 148–53

3- Kraus DH, Shah JP, Arbit E, et al. Complications of craniofacial resection for tumors involving the anterior skull base. Head Neck 1994; 16(4):307-12.

4- Devaiah AK, Larsen C, Tawfik O, et al. (2003): Esthesioneuroblastoma: endoscopic nasal and anterior craniotomy resection. Laryngoscope; 113(12): 2086-90.

5- Varsheny S, Bist S, Gupta N, et al. Anterior craniofacial resection-for paranasal tumors involving anterior skull base. Indian J Otolaryngol Head Neck Surg 2010; 62(2): 103-107.

6- Lund. surgical management of midfacial tumors: transfacial degloving,midfacial degloving, or endoscopic approach. Current opinion in Otolaryngolgy& Head and Neck Surgery 2001; 9: 95-99.

7- Bhatki AM, Pant H, Carl H. et al. The expanded endonasal approach for the treatment of anterior skull base tumors. Operative Techniques in Otolaryngology 2010; 21: 66-73.

8- Hanna E, DeMonte F, Ibrahim S, et al. Endoscopic resection of sinonasal cancers with and without craniotomy: oncologic results. Arch Otolaryngol Head Neck Surg 2009; 135: 1219- 1224.

9- Plinkert PK and, Zenner HP. Transfacial approach, craniofacial resection and midface degloving in surgery of malignant tumors of the anterior cranial base and adjacent paranasal sinuses. HNO 1996; 44: 192-200.

10- Castelnuovo P, Battaglia P, MD, Locatelli D, et al. Endonasal micro-endoscopic treatment of malignant tumors of the paranasal sinuses and anterior skull base. Operative Techniques in Otolaryngology 2006; 17: 152-167.

11- Snyderman CH, Carrau RL, Kassam AB, et al. Endoscopic skull base surgery: Principles of endonasal oncological surgery. J Surg Oncol 2008; 97: 658-664.

12- Eloy JA, Vivero RJ, Hoang K, et al. Comparison of transnasal endoscopic and open craniofacial resection for malignant tumors of the anterior skull base. Laryngoscope 2009; 119: 834-840.

13- Wellman BJ, Traynelis VC, McCulloch TM, et al. Midline Anterior Craniofacial Approach for Malignancy: Results of En Bloc Versus Piecemeal Resections. Skull Base Surgery 1999; 9(1): 41-46.

14- Carrau RL, Kassam AB, Snyderman CH, et al. Endoscopic transnasal anterior skull base resection for the treatment of sinonasal malignancies. Oper Tech Otolaryngol 2006; 17: 102-110.

15- Raza SM, Garzon-Muvdi T, Gallia GL, et al. Craniofacial Resection of Midline Anterior Skull Base Malignancies: A Reassessment of Outcomes in the Modern Era. World Neurosurgery 2012; 78: 128-136.

16- Patel SG, Singh B, Polluri A, et al. Craniofacial surgery for malignant skull base tumors. Report of an international collaborative study. Cancer 2003; 98: 1179-1187.

17- Jardeleza C, Seiberling K, Floreani S, et al. Surgical outcomes of endoscopic management of adenocarcinoma of the sinonasal cavity. Rhinology 2009; 47: 354-361.

18- Deschler DG, Gutin PH and Mamalek AN. Complications of anterior skull base surgery. Skull Base Surg 1996; 6: 111-118.

19- Shah J, Kraus DH, Arbit E, et al. Craniofacial resection for tumors involving the anterior skull base. Otolaryngol Head Neck Surg 1992; 106: 387-393.

20- Suarez C, Liorente JL, Fernandez De Leon R, et al. Prognostic factors in sinonasal tumors involving the anterior skull base. Head Neck 2004; 26: 136-144.

21- Stammberger H, Anderhuber W, Walch Ch, et al. Possibilities and limitations of endoscopic management of nasal and paranasal sinuses malignancies. Acta Otorhinolaryngol Belg 1999; 53: 199-205.

22- Casiano RR, Numa WA and Falquez AM. Endoscopic resection of esthesioneuroblastoma. Am J Rhinol 2001; 15: 271.

الاساليب المختلفة لعلاج أورام ألانف و التجويف الغربالى المتخللة لقاع الجمجمة الامامى

محمد صادق رفاعى*،عمرو حسن السنباوى،طارق عبد المعطى عمران، عز الدين غنيمى الشيخ
، طارق عبد الظاهر عمارة، علاء عمر السيد خزبك
أقسام الأذن والأنف والحنجرة – كلية الطب – جامعة الزقازيق وجامعة القاهرة*

تعتبر أورام الانف و التجويف الغربالى المتخللة لقاع الجمجمة الامامى من التحديات التى تواجه الجراحين و ذلك لطبيعتها التشريحية المعقدة وتضمنها لبعض الاجزاء الهامة بالجسم.
ولذلك فان الاساليب المختلفة لعلاج هذه الاورام يعتمد على نوعية هذه الاورام من الناحية الباثولوجية وعلى الاعراض الاكلينيكية لهذه الاورام و قديما كانت الطرق الجراحية التقليدية هى الوسيلة الذهبية لعلاج مثل هذه الاورام المتخللة لقاع الجمجمة الامامى و لكن فى السنوات الاخيرة و حينما تغير الهدف من العلاج الى امكانية استئصال هذه ألاورام مع أقل مضاعفات ،بدأ يظهر اتجاه جديد لاستئصال مثل هذه الاورام باستخدام المناظيرز
و لذلك فان الهدف من هذا البحث هو تقييم ألاساليب المختلفة لعلاج أورام ألانف و التجويف الغربالى المتخللة لقاع الجمجمة الامامى.
و لقد أجريت هذه الدراسة بمستشفيات جامعة الزقازيق و مستشفى القصر العينى بجامعة القاهرة و التى تم اجرائها على عشرة مرضى يعانون من وجود أورام بالانف و التجويف الغربالى متخللة لقاع الحمحمة الامامى.
وعلى حسب حجم الورم و مقدار تخلله لقاع الجمجمة و كذلك العين، تم تقسيم المرضى الى مجموعتين كل منهما تضم خمسة مرضى، حيث تم استئصال الورم من المجموعة الاولى بواسطة الطرق الجراحية المعتادة و تم استئصال الورم من المجموعة الثانية بواسطة المناظير. و بعد العملية تم استكمال العلاج بواسطة العلاج الاشعاعى و الكيماوى على حسب طبيعة الورم الباثولوجية تحت اشراف اطباء العلاج الاشعاعى و الكيماوى. و لقد تراوحت مدة متابعة المرضى بعد العلاج من اثنى عشر شهرا الى ثلاثين شهر.
و لقد أظهرت نتائج البحث أن أكثر أعراض الورم حدوثا هى وجود انسداد بالانف و نزيف من الانف و جحوظ بالعين وأن جميع ألاورام كانت خبيثة.
وبالنسبة للمضاعفات بعد العملية، فقد حدثت لمريضين من المجموعة الاولى فى صورة تلوث للجرح و بعض المضاعفات المتعلقة بالجهاز العصبى المركزى فى صورة تشنجات أو وجود هواء بالمخ. بينما حدثت مضاعفات لمريض واحد بالمجموعة الثانية فى صورة انسكاب السائل النخاعى من الانف.
و لقد أسفرت النتائج النهائية للبحث بعد فترة المتابعة عن أنه فى المجموعة الأولى، تم شفاء ثلاثة مرضى بشكل كامل و عودة للورم الى مريض واحد ووفاة مريض واحد بينما فى المجموعة الثانية، تم شفاء ثلاثة مرضى بشكل كامل و عودة للورم الى مريضين.
ولقد استخلصنا من هذه النتائج أن استخدام المنظار في علاج أورام ألانف و التجويف الغربالى المتخللة لقاع الجمجمة الامامى يقلل من المضاعفات و الوفيات بعد العملية ولكن فرصة عودة الورم أكبر بالمقارنة باستخدام الطرق الجراحية المعتادة.
و لهذه الاسباب فانه يمكن استخدام المنظار في علاج أورام ألانف و التجويف الغربالى المتخللة لقاع الجمجمة الامامى كبديل للطرق الجراحية المعتادة فى بعض الحالات البسيطة.