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COMPARATIVE STUDY BETWEEN MICROSCOPIC SURGICAL EXCISION OF CEREBELLOPONTINE ANGLE MASS VERSUS ENDOSCOPIC ASSISTED EXCISION

By

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ABSTRACT

Background: The combination of microscopic and endoscopic technique has showning significant advantages in the management of various cerebellopontine angle (CPA) lesions through different approaches. Endoscopic-assisted techniques have frequently been applied to cerebellopontine angle (CPA) surgery in the context of minimally invasive craniotomies, which increase the extent of tumor resection, minimize complications, and preserve the function of the delicate CPA structures.

Objective: To assess the outcome of microscopic and combined microscopic with endoscopic technique as minimally invasive approach in Al Azhar experience.

Patients and Method: twenty-two consecutive patients proved to have CPA masses were treated with microscopic and combined microscopic with endoscopic technique between September 2016 and December 2019 at the Neurosurgery Department, Al-Azhar University Hospitals. All patients included in this study have CPA masses. The reliability of the extent of microscopic removal was evaluated with endoscopic exploration. Additional resection was performed with both microscopic and the combined microscopic-endoscopic technique. Endoscopically verified total resection was validated by postoperative MRI. The function of the cranial nerves was evaluated to assess the impact of the combined technique on their function.

Results: The mean age of patients in this study was ~ 43 years. All cases are clinically elevated by Glasgow Outcome Score (GOS) early after wakeup of anesthesia and late after 24 hrs. The favorable outcome achieved early in 18 patients (81.82%) and late in 19 patients (86.36%), while unfavorable outcome achieved early in 4 patients (18.18%) with improvement of one case later on and the achieved unfavorable outcome became 3 patients (13.64%). In correlation of pathology to GOS; schwannoma cases show 9 favorable outcome and only one unfavorably outcome, all 8 epidermoid cases were favorably outcome, while meningioma cases show 1 favorably and 2 unfavorably outcome. Regarding 7th cranial nerve injury; inadvertent injury occurred in one meningioma patient. Three patients experienced transient deterioration of their facial nerve functions in the postoperative period and improved by the end of the first month postoperative.

Conclusion: This method provides simultaneous microscopic and endoscopic visualization and dissection techniques through skull-base approaches to CPA tumors. It overcomes some of the shortcomings of endoscopic-assisted surgery, further extends the surgical field, and increases the radicality of tumor resection with good functional outcomes.

Key words: CPA = cerebellopontine angle; EVTR = endoscopically verified total resection; cerebellopontine angle; combined technique; endoscopic skull-base surgery; endoscopy; skull-based approach; tumor.

INTRODUCTION

Cerebello-pontine angle (CPA) tumors are the most common neoplasms in the posterior fossa, accounting for 5-10% of intracranial tumors. Most CPA tumors are benign, with over 85% being vestibular schwannomas (acoustic neuromas), lipomas, vascular malformations, and hemangiomas. The most frequent non-acoustic CPA tumors are meningiomas, epidermoids (primary cholesteatomas), and facial or lower cranial nerve schwannomas. Primary malignancies or metastatic lesions account for less than 2% of neoplasms in the CPA. *(Berkowitz O et al., 2015)*. Early in the 20th century, CPA lesions were difficult to be diagnosed and rarely completely excised. Indeed, the mortality rate for operative intervention in the posterior fossa approached 50%. However, revolutionary advances in neuroradiologic imaging and surgical techniques and approaches have made these lesions almost uniformly treatable with acceptable morbidity and very low rates of mortality. Surgical intervention remains the most definitive means for complete tumor removal for most of these lesions. Radiation therapy has gained popularity to arrest tumor growth with specific tumor types and is also an option for patients who are unwilling or medically unable to undergo surgery. The endoscope has been used in CPA surgery in two ways: 1) endoscopic controlled, when the endoscope is the only source of visualization and instruments are passed alongside the endoscope; and 2) endoscopic assisted, when the endoscope is used as a supplementary visualization tool to assist in primarily microscopic procedures. The advantages of the use of the endoscope have been emphasized in the context of minimally invasive surgery. *(Betka et al 2011)*. With the goal of decreasing morbidity by minimizing soft-tissue dissection and decreasing the size of the craniotomy. In this study, we emphasize the endoscope's utility in achieving improved results in skull-base approaches, as a tool capable of expanding the surgical field, and for increasing the resectability of challenging lesions in the posterior fossa. Long-term patient morbidity is best reduced through maximal safe tumor resection rather than decreasing the size of the craniotomy. Used in this manner, the endoscope demonstrated utility in 3 important aspects: 1) extending the surgical field into additional intracranial compartments; 2) allowing for visualization and resection of residual tumor not adequately visualized with the microscope; and 3) improving the prediction of the extent of resection. In addition, the technique described here overcomes some of the previously detailed shortcomings of the use of the endoscope in the CPA *(Abolfotoh et al. 2015)*.

PATIENTS AND METHODS

Twenty-two consecutive patients proved to have CPA masses were treated with microscopic and combined microscopic with endoscopic technique between September 2016 and December 2019 at the Neurosurgery Department, Al-Azhar University Hospitals. All patients included in this study have CPA masses. The reliability of the extent of microscopic removal was evaluated with endoscopic exploration. Additional resection was performed with both microscopic and the combined microscopic-endoscopic technique. Endoscopically verified total resection was validated by postoperative MRI. The function of the cranial nerves was evaluated to assess the impact of the combined technique on their function.

All patients in this study were subjected to the following: Clinical assessment (history and examination, radiological assessment by Audiometry, CT brain, MRI brain with contrast and Pre procedural preparation. In this study two surgical techniques were approached; ordinary microscopic surgical excision was approached in 9 cases (40.9%) while endoscopic assisted excision approached in rest of 13 cases (59%), all via Retrosegmoid approach.

All patients assisted clinically post-operative by mean of Glasgow Outcome Scale early postoperative (2hrs after full recovery) and late postoperative (2nd day of operation) and full neurological examination especially cranial nerves including House-Brackmann Facial Nerve Grading System for facial nerve assessment, and also all patients assisted radiologically post-operative early (after full recovery or 2hrs postoperatively if there is delayed recovery) by CT scan to assess tumor bed and ventricular system to exclude any early complications like hematomas, hydrocephalous and pneumocephalous. And we can repeat it if there is any deterioration of conscious level to assess delayed onset hydrocephalous, hematomas or ischemia. Although MRI study follow up performed 2 months after operation to assess tumor resection either totally or partially excised, but we can do it earlier if there is major neurological deficit like bulbar manifestation.

During the period of the study, data were collected and saved in summary sheets case by case. Hospital records and radiology films of the patients were electronically saved. The statistics were made from a master table containing the relevant clinical and radiological data extracted from the summary sheets. Missing information was obtained by reviewing the soft or the hard copies of the hospital records and the radiological films.

All percentages are approximated to two decimal places. Statistics were made by Microsoft office 2010, Microsoft excel 2010 and SPSS. Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation, Chi-square by SPSS V17. Chi-square the hypothesis that the row and column variables are independent, without indicating strength or direction of the relationship. Pearson chi-square and likelihood-ratio chi-square. Fisher's exact test and Yates' corrected chi-square are computed for 2x2 tables.

P-value > 0.05 non-significant.

P-value ≤ 0.05 Significant.

P-value < 0.01 Highly Significant.

RESULTS

The mean age of patients in this study was ~ 43 years with the youngest patient 19 years old and the oldest 65 years old, and study included 13 females (59.1%) and 9 males (40.9%), where the female: male ratio was 1.5:1. The most common presentation was diminution of hearing up to hearing loss in 18 patients (81.8%) followed by facial dysfunction in 13 patients (59.1%) followed by trigeminal nerve affection in 12 patients (54.5%) in the form of neuralgia and hypoesthesia followed by headache and cerebellar dysfunction in the form of ataxia and nystagmus in 11 patients (50%). Also, there were 5 patients (22.7%) presented by abducent nerve dysfunction and 1 patient (4.5%) presented by bulbar manifestation.

Preoperative hydrocephalus present in 4 patients one of them requires preoperative CSF diversion procedure in the form of ventriculo-peritoneal shunt. The pathology was confirmed by intraoperative finding and gross picture of the tumor and postoperative histopathological analysis of biopsy. In our study there were 10 cases of vestibular schwannoma (45.5 %), 8 cases of epidermoid (36.4%) and 4 cases of meningioma (18.2%). The tumor totally excised in 19 patients, 2 other patients the tumor capsule was tightly adhered to important structure so subtotal excision was preferred and part of capsule remained not excised while partial excision achieved in one patient.

Intraoperatively in six cases, the trigeminal nerves were completely encased by tumor without displacement. In one patient, the anterior inferior cerebellar artery (AICA), located on the same side of the tumor in relation to the trigeminal nerve, was found to be compressing the nerve directly on its ventro-caudal aspect; thus, the nerve was compressed by both the tumor and the artery on the same side. In this patient, micro vascular decompression (MVD) of the trigeminal nerve was performed in addition to tumor removal. In two patients (5%), the capsule or a small amount of tumor content were left because of dense adhesion to the critical neurovascular structure or tumor extension beyond the midline.

Postoperatively all cases are clinically evaluated by Glasgow Outcome Score GOS early after wakeup of anesthesia and late after 24 hrs. The favorable outcome achieved early in 18 patients (81.82%) and late in 19 patients (86.36%), while unfavorable outcome achieved early in 4 patients (18.18%) with improvement of one case later on and the achieved unfavorable outcome became 3 patients (13.64%). As regard age of the patients the unfavorable outcome achieved in age groups 40 to 50 years and more than 50; while all patients less than 40 years were favorably outcome. In correlation of surgical technique to GOS the favorable outcome was achieved in 6 cases operated by microscopic technique and 13 cases operated by endoscopic assisted technique; while unfavorably 3 cases were all operated by microscopic technique.

In correlation of pathology to GOS; schwannoma cases show 9 favorable outcome and only one unfavorably outcome, all 8 epidermoid cases were favorably outcome, while meningioma cases show 1 favorably and 2 unfavorably outcome.

Postoperatively; regarding wound collection, 3 patients (13.63%) had subgaleal wound collection and these patients were continued on IV antibiotics for a week. Eventually, these collections resolved in 2 patients after 1 week and persisted in 1 patient progressing to deep wound infection.

Regarding wound infection, five patients (22.72%) had wound infection; three patients had superficial wound infection and resolved with IV antibiotics and repeated wound dressing for 6 days. One patient had deep wound infection that didn't respond to I.V. antibiotics and repeated wound dressing and the patient undergone surgical debridement for the wound under G.A., eventually the infection resolved and the patient was discharged 10 days after the debridement. The last one developed persistent meningitis and died 1month after operation.

Regarding 7^{th} cranial nerve injury; inadvertent injury occurred in one meningioma patient when attempts were made to dissect the capsules from the nerve aiming at total excision the deterioration was permanent. Three patients experienced transient deterioration of their facial nerve functions in the postoperative period and improved by the end of the first month postoperative.

Postoperatively in three of the patients that experienced deficits, a preexisting facial palsy worsened to grade IV on the House Brackmann (H-B) scale (from grade III); six months after surgery, there nerve function improved moderately (grade III); three of the patients that experienced deficits, a preexisting facial palsy worsened to grade V (2 from grade III and 1 from grade IV); nine months after surgery, there nerve function improved moderately (grade III).

Regarding deterioration of cerebellar function two patients worsened in cerebellar function and they improved by time of discharge. While one patient developed postoperative CSF leakage from wound 2 weeks after surgery with oropharengeal salty sensation; managed surgically by dural fascia lata graft and packing of mastoid air cells my muscle and wax.

Regarding hydrocephalous four patients were complaining of preoperative hydrocephalous; one of them need preoperative v-p shunt while the other managed by direct tumor excision and hydrocephalous resolved in two patients and the last one need v-p shunt after tumor excision.

Postoperatively six patients presented with hydrocephalous five new and one has preexisting hydrocephalous mentioned above; one of the new five patients was also complicated by postoperative hemorrhage and managed surgically by evacuation of hematoma and supratentorial external ventricular drain but the patient died 1 week after operation and the other four patients managed by v-p shunt. In correlation of tumor size to preoperative hydrocephalous one patient has tumor size G3 in House grading; another one has tumor G4 while two patients have tumor G5.

In correlation of surgical technique to postoperative hydrocephalous three patients were managed through microscopic excision and other three were managed through endoscopic assisted technique.

Regarding postoperative hemorrhage only two patients presented by post-operative hematoma in tumor bed associated with brain stem infarction and died later on after 1 week for one case and ten days for the other.

In correlation to pathology both cases of postoperative hematoma were CPA meningioma.

Regarding tumor size, the smallest tumor we operated upon in our study was 3.2 cm3, in the maximum diameter the largest was up to 8 cm3.

Regarding tumor size, it was quite apparent that patients with large size had higher incidence of postoperative complications than those with small size.

All patients had followed up in the outpatient clinic following surgery. The shortest period of follow up was two months, the longest was twenty months.

Outcome of the twenty-two patients included in the study, eleven patients (50%) had good outcomes, six patients (27.27%) had fair outcomes, two patients (9.09%) had poor outcome, while 3 patient (13.63%) dead.

Considering the correlation of outcome to the size of the tumor it was evident that the patients who had large tumor size (more than 6-cm) had more post-operative complications as hydrocephalus and chemical meningitis while patients who had small tumor size had good outcomes.

Considering the correlation of outcome to the removal of the capsule it was evident that the patients who undergone gross total resection of the capsule had fair and poor outcomes and the patients who undergone subtotal resection of the capsule had better outcome.

DISCUSSION

The endoscope has been used in CPA surgery in two ways: 1) endoscopic controlled, when the endoscope is the only source of visualization and instruments are passed alongside the endoscope; and 2) endoscopic assisted, when the endoscope is used as a supplementary visualization tool to assist in primarily microscopic procedures. The advantages of the use of the endoscope have been emphasized in the context of minimally invasive surgery *(Betka et al 2011)*. With the goal of decreasing morbidity by minimizing soft-tissue dissection and decreasing the size of the craniotomy. In this study, we emphasize the endoscope's utility in achieving improved results in skull-base approaches, as a tool capable of expanding the surgical field, and for increasing the resectability of challenging lesions in the posterior fossa.

Advantages of the Endoscope:

a. Extending the Surgical Field: In this study, the endoscope was useful for expanding the surgical field. In particular, through the tentorial incisura, the endoscope allows an extension of the microsurgical approach from the posterior fossa to the middle fossa, enabling the resection of tumor from the subchiasmatic cistern, Meckel's cave, and even across the midline. The view through the microscope in the CPA region is limited to the dorsal surface of the neurovascular structures, but the endoscope provides advantage point ventral to these structures. Visualizing and Resecting Additional Tumor: the utility of the endoscope in visualizing and resecting tumor in microscopic blind spots and around corners is well established (Takemura et al 2014).The endoscope, especially with angled lenses, allows visualization of a residual lesion in locations not well seen through the microscope.

b. Ebner and colleagues emphasized the importance of using the endoscope and microscope as complementary modalities to provide more complete visualization of the CPA. Our study further emphasizes the endoscope's essential complementary role in identifying and allowing for the resection of remnant tumor in these locations. In addition, the closer vantage point, increased magnification, and improved illumination facilitate careful inspection of the dura and bone. In this series, use of the endoscope frequently identified infiltrated dura and bone, which appeared to be normal under microscopic visualization *(Ebner et al., 2009)*.

A. **Improved Prediction of the Extent of Resection:** In this study highlighted the poor reliability of the microscope alone in evaluating the extent of resection intraoperatively. The endoscope improved the reliability of intraoperative inspection after tumor resection. In thirteen patients, gross-total resection was believed to be achieved after microscopic dissection, but the endoscope identified additional tumor in 10 patients (77%). Conversely, the endoscope was highly predictive of postoperative MRI findings.

B. **Overcoming the Shortcomings of the Endoscope:** the crowded complex anatomy of the posterior fossa, and the lack of a flexible noneloquent corridor such as the nasal cavity, complicate the use of the endoscope in the CPA. A number of limitations with its use have been reported, particularly with the freehand technique described by de Divitiis and associates *(De Divitiis et al., 2007)*.

These limitations include: 1) difficulty safely inserting and removing instruments, because the endoscope's field of view is distal to critical structures; 2) the endoscope's presence as a third instrument in a small surgical window, resulting in "sword fighting" between instruments and difficulty with performing microdissection *(Little et al., 2014)*.

One major concern with the navigation of an endoscope in a limited corridor is the potential for additional injury to the cranial nerves, either through direct trauma or indirect thermal-related injury from the dual light sources *(Hori et al., 2010)*.

The additional visualization of residual tumor in the foramina and around neurovascular corners may prompt a more aggressive pursuit of total resection, which could also contribute to neural deficits.

Despite these concerns, we documented improvements in cranial nerve function in a significant number of patients with preoperative deficits, especially with swallowing and facial sensation. 45.45 % of patients without preoperative facial palsy had developed new facial nerve weakness at the time of the most recent follow-up evaluation, which is within the minimal expected range of resection risks for surgery in the CPA. In study done by *Abolfotoh et al., 2015*; 10 % had developed new facial nerve weakness post operatively.

The majority of patients with new postoperative facial deficits harbored vestibular schwannomas with an extension into the internal auditory canal, while one patient had large meningioma and inadvertent injury occurred.

Most distinct from the “minimally invasive” perspective, the broad surgical field provided by skull-base approaches allows the surgeon to expand the exposure and perform 2-handed microdissection under endoscopic visualization. In an endoscopic anatomical study of the CPA, Chaynes and colleagues concluded that craniotomies smaller than 10 mm did not allow for complete exploration of the CPA, and maneuverability was significantly limited. These hindrances were overcome with craniotomies of 15 mm or more *(Chaynes et al., 1998).*

Ebner and associates emphasized that adjunctive use of the endoscope should not minimize the exposure obtained through the microsurgical approach *(Ebner et al., 2009).*

While we agree with these assessments, our technique goes even further and emphasizes the importance of adjunctive use of the endoscope in expanding the microsurgical approach, thus providing additional visualization and dissection capabilities through the same exposure rather than the same visualization through a smaller exposure.

Yuguang et al., 2005; included 1 meningioma in their series of twenty-three CPA lesions and noted its utility in identifying residual tumor and protecting the cranial nerves.

Schroeder et al., 2011; reported the largest series of meningiomas resected with an endoscopic-assisted technique, 23 of which were in the CPA. In their study, the endoscopic view visualized tumor hidden from the microscopic view in 56% of cases and thus demonstrated the high utility of the endoscope in identifying hidden tumor.

Prudently, *Schroeder et al., 2011*; note that movement of the endoscope within the CPA is dangerous and thus advocates for the use of an endoscope fixation arm. The use of the fixation arm is effective in preventing trauma to the neurovasculature of the CPA. However, it is limited by not providing visualization of the CPA during instrument exchanges and it does not allow for the dynamic visualization of the region as dissection proceeds. Dynamic visualization is of particular importance in endoscopic dissection because it helps to compensate for the loss of stereoscopic vision. Our technique resolves these two issues by providing a tandem endoscopic and microscopic view with a third hand guiding the endoscope under microscopic visualization.

The endoscope is useful in resecting meningiomas because it can identify and remove hidden tumor, especially superiorly and laterally beneath the tentorium, superior to the trigeminal nerve, and in the jugular foramen. In this study, the unique advantage of using the endoscope with meningiomas was identifying abnormal dura and bone devitalized by tumor, which was not possible with the microscope. Removal and coagulation of the dura, as well as the drilling of abnormal bone, was completed with the endoscope. The primary drawback of using the endoscope in meningioma surgery is the frequent need to clean the lens because of the bloody nature of the surgery and the accumulation of bone dust from drilling. For this reason, we recommend introducing the endoscope as late as possible in the course of microscopic dissection of meningiomas.

The use of the endoscope for schwannoma surgery has been frequently reported with emphasis on the extent of resection, hearing preservation, and facial nerve function and demonstrated that the remarkable utility of the endoscope in increasing the extent of resection and improving functional outcomes of the facial nerve. However, there was little evidence of improved hearing preservation with use of the endoscope *(Göksu et al., 1999)*.

Our findings corroborate those of other studies that the endoscope is helpful in removing tumor at the canal fundus. We expect that it also improves hearing preservation by decreasing the amount of bone drilled in the posterior wall of the canal, thus decreasing the risk of injury to the superior and posterior semicircular canals. The microscopic view, on the other hand, requires wide drilling of the canal for visualization, and this can be reduced with the endoscope. The utilization of the endoscope was also helpful in improving hearing by preservation of the cochlear fibers at the lamina cribrosa.

Reports of the use of the endoscope in CPA epidermoid surgery are not uncommon. *Tuchman et al., 2014*; most recently reported on the specific use of the endoscope in the removal of 9 CPA epidermoid tumors, 7 of them through a retrosigmoid approach, and 2 with a subtemporal approach. These investigators used an endoscopic-assisted technique with initial resection performed with the microscope and importantly report that additional tumor was identified with the endoscope in 85% of cases. They recommend a 2-surgeon, 4-hand technique rather than the use of a holder to provide a dynamic view of the operative field. Our findings and principles fully concur with their study. We do, however, emphasize the simultaneous use of the microscopic view with the endoscopic dissection to add protection to the proximal cranial nerves *(Tuchman et al., 2014)*.

Zhang et al., 2000 reported on the use of the endoscope in 30 posterior fossa epidermoid cases in their broad review of 126 neuroendoscopic procedures. However, this early report focused on the use of the endoscope as a tool in neurosurgery and did not provide a detailed description of the endoscope's role in CPA epidermoid surgery *(Zhang et al., 2000)*.

Schroeder et al., 2004; reported on 8 cases of CPA epidermoids; in 4 cases the tumor was removed microscopically with the use of the endoscope only for verification and not dissection. In the other 4 cases, a technique analogous to the previously mentioned meningioma series was utilized. In that series 5 cases were performed utilizing a retrosigmoid and 3 by a pterional approach, with small craniotomies. The endoscope revealed microscopically hidden tumor in all cases. However, total removal of the capsule was only achieved in 3 cases *(Schroeder et al., 2004)*.

Safavi-Abbasi et al., 2008; reported a series of 11 patients in which the endoscope was used for inspection following microscopic resection in epidermoid surgery. They advocated against the use of the endoscope for tumor dissection in epidermoids, recommending it to be used solely for inspection *(Safavi-Abbasi et al., 2008)*.

Patients with epidermoid tumors may benefit the most from the endoscopic-assisted technique. Epidermoids tend to travel away from their primary location, often extending to the middle fossa, crossing the midline, and expanding in the posterior fossa cisterns. The endoscope can extend the microscopic approach to follow the epidermoid debris into the middle fossa, and to the contralateral side of the brainstem. In addition, because of the texture of the tumor, hidden pieces are easily removed with the endoscope, and the freehand technique and tandem view allows for the cautious microdissection necessary for dissection of the capsule. Finally, because postoperative MRI does not clearly show the residual tumor capsule, we believe that the endoscopic view is the best for evaluating the extent of resection.

CONCLUSION

The literature has historically emphasized the use of the endoscope in minimally invasive techniques. In this study, we emphasize its significant role in standard and expanded skull-base surgery. The use of the endoscope improved access to a variety of skull-base tumors and was effective in expanding the standard approaches into additional intracranial compartments. It also increased the surgeon's ability to evaluate the extent of resection intraoperatively. Most importantly, it improved the ability to achieve additional safe tumor resection, which may be considered the greatest means of reducing long-term patient morbidity. To minimize the shortcomings of endoscopic-assisted surgery.

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دراسة مقارنة بين الاستئصال الجراحي المجهري لأورام الزاوية ما بين المخيخ وقنطرة جزع المخ مقابل الاستئصال بمساعدة المنظار

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قسم جراحة المخ والأعصاب

خلفيـــة البحـــث: أظهـــرت النتـــائج الجراحيـــة أن الجمـــع بـــين التقنيـــة الميكرســـكوبية مـــع اســـتخدام المنظـــار الجراحـــي أضـــاف مزايـــا مهمـــة فـــي استئصـــال أورام الزاويـــة مـــا بـــين المخـــيخ وقنطـــرة جـــزع المـــخ، والتـــي تزيـــد مـــن مـــدى استئصـــال الـــورم وتقليـــل المضـــاعفات وتحـــافظ علـــى وظيفـــة الأجزاءالدقيقـــة المكونـــة للزاويـــة مـــا بـــين المخـــيخ وقنطرة جزع المخ.

الهـــدف مـــن البحـــث: تقيـــيم نتـــائج التقنيـــة المجهريـــة لأورام الزاويـــة مـــا بـــين المخـــيخ وقنطـــرة جـــزع المـــخ مقابـــل الاستئصـــال بمســـاعدة المنظاركأســـلوب مـــن أســـاليب التخلات الجراحية المحدودة.

المرضـــى وطـــرق البحـــث: اشـــتملت الدراســـة علـــي اثنـــان وعشـــرون مريضـــا ثبـــت أن لـــديهم أورام الزاويـــة مـــا بـــين المخـــيخ وقنطـــرة جـــزع المـــخ وقـــد تـــم إجـــرء الجراحـــة لهـــم باســـتخدام الميكروســـكوب فقـــط والميكروســـكوب مـــع إضـــافة المنظـــار الـــداخلي بـــين ســـبتمبر 2016 وديســـمبر 2019 فـــي قســـم جراحـــة المـــخ والأعصـــاب ، مستشـــفيات جامعة الأزهر.

النتـــائج: كـــان متوســـط عمـــر المرضـــى فـــي هـــذه الدراســـة ~ 43 ســـنة. يـــتم فحـــص جميـــع الحـــالات ســـريريًافي وقـــت مبكـــر بعـــد الاســـتيقاظ مـــن التخـــدير ومتـــأخرة بعـــد 24 ســـاعة. تـــم تحقيـــق النتيجـــة الإيجابيـــة فـــي وقـــت مبكـــر عنـــد 18 مريضًـــا (81.82٪) ومتـــأخرًا فـــي 19 مريضًـــا (86.36٪)، بينمـــا تـــم تحقيـــق النتيجـــة غيـــر المواتيـــة مبكـــرًا فـــي 4 مرضـــى (18.18٪) مـــع تحســـن حالـــة واحـــدة لاحقًـــا وأصـــبح النتيجـــة غيـــر المواتيـــة 3 مرضـــى (13.64٪). أمـــا إصـــابة العصـــب القحفـــي الســـابع. حـــدثت إصـــابة غيـــر مقصـــودة فـــي أحـــد مرضـــى الـــورم الســـحائي. عـــانى ثلاثـــة مرضـــى مـــن تـــدهور عـــابر فـــي وظـــائف

العصب الوجهي في فترة ما بعد الجراحة وتحسن بحلول نهاية الشهر الأول بعد الجراحة.

الإستنتاج: أكدت الدراسات الطبية على استخدام المنظار الداخلي في تقنيات التدخلات الجراحية المحدودة: في هذه الدراسة، نؤكد على دورها المهم في الجراحة النموذجية والموسعة لقاعدة الجمجمة. فقد أدى استخدام المنظار إلى تحسين الوصول إلى مجموعة متنوعة من أورام قاعدة الجمجمة قد أثبت فاعليته وأهميته في ازدياد الأساليب الجراحية لقاع الجمجمة. كما أنه زاد من قدرة الجراح على تقييم مدى الاستئصال أثناء الجراحة. والأهم من ذلك، أنها حسنت القدرة على تحقيق استئصال آمن إضافي للورم، والذي يمكن اعتباره أعظم وسيلة للحد من اعتلال المريض على المدى الطويل. لتقليل أوجه القصور في الجراحة بمساعدة المنظار الجراحي كما أنه ادي لتقليل المضاعفات الناجمة عن الجراحة الميكرسكوبية بدون استخدام المنظار.