

ENDOSCOPIC ENDONASAL TRANS-SPHENOIDAL PITUITARY SURGERY (EETSS): CLINICO-RADIOLOGICAL PRESENTATION AND OUTCOME IN ILORIN: OUR EXPERIENCE.

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ABSTRACT:

Objective: To share our experience on the clinical presentation and management of patients with pituitary adenoma using Endoscopic Endo-Nasal Trans-Sphenoidal Surgery (EETSS)

Materials and Method: A retrospective review of all patients with non-functional pituitary macro-adenoma seen in who underwent EETS approach between May 2012 and April 2018. The clinical presentations of the patients were documented. All Patients had pre and postoperative visual assessment and they had radiologic investigation. Endocrine evaluations were done pre and postoperatively. All patients were operated by a combined team of Ear, Nose and Throat (ENT) surgeons and Neurosurgeons using rigid endoscope 18cm (4mm; 0 and 30 degree).

Results: A total of 18 patients; 12 females and 6 males, were operated via EETS. All patients had visual impairments at presentation which improved postoperatively in 14 patients. 6 patients were postmenopausal, 5 had amenorrhea with secondary infertility. There were two postoperative deaths in intensive care unit. The Mean hospital stay was 4.9 days. Histological diagnosis of pituitary adenoma in was made in 17 patients and one patient had malignant mucoepithelial tumour.

Conclusion: Pituitary tumour constituted about 10.5% of all intracranial tumors in our centre, visual impairment is the commonest presentation and total tumor resection via the EETS is about 78%. The approach showed improve vision in 2/3rd postoperatively, mean hospital stay was about 4.9days with nasal crust formation being the most observed complication and mortality of 11.1%.

Keywords: Endoscopic, Endonasal, Transphenoidal, Pituitary, Visual impairment, Nasal Crust.

INTRODUCTION

Pituitary adenomas are slow growing tumours which are frequently encountered in neurosurgical practice with an incidence of about 1 to 7 per 100,000 and it also accounts for 10% - 15% of all intracranial tumours with a prevalence of 24% in autopsy studies of adults¹⁻⁴. It is one of the disorders of the sellar region and represents about a third of all primary tumours affecting the central nervous system³⁻⁵. Pituitary adenoma may be a secreting or a non-secreting variety. Most patients with non-secreting or non-functional tumours present to the ophthalmologist due to compressive effect on the visual pathway manifesting with symptoms of visual impairment or visual loss.⁶ Very few with secreting or functional tumours manifest the hormonal disturbances or associated findings.⁶ In recent years, the availability of imaging technologies has made the diagnosis easier but this is far from reality in resource poor countries like Nigeria due to either poverty or limited or non-availability of these technologies thus leading to late diagnosis or undiagnosis⁷. The treatment modalities for pituitary adenomas include medical therapy, surgery, and radiation therapy. Prolactinoma which is the most common endocrine active pituitary tumour is usually amenable to medical therapy while surgery is indicated for others such as growth hormone and Adenocorticotrophic hormone (ACTH) secreting adenomas. With non-secreting adenomas surgery usually constitutes the first line of treatment and radiotherapy is supplementary⁵⁻⁷. The Trans-sphenoidal route is an effective and the preferred surgical access for patients with pituitary adenomas due to natural air spaces of the nasal cavity and the sphenoid sinus thus constituting a convenient corridor to access and treat the skull base lesions in Endoscopic Endo-Nasal Trans-Sphenoidal Surgery (EETSS)⁸. The relationship of the sphenoid cavity to the nasal cavity below and the pituitary gland above makes the trans-sphenoidal route the surgical access of choice for sellar tumors⁸. The EETS approach has minimal invasiveness, lower incidence of complications, lower morbidity and mortality rates compared with traditional transcranial approach^{8,9}. The first transnasal resection of a pituitary tumour was performed by Schloffer in 1907¹⁰. Cushing¹¹ systematically applied a transsphenoidal approach for sellar lesions. This technique was refined and popularized by

Guiot¹² and Hardy¹³ with the introduction of the operative microscope. The development of endoscopic techniques for surgery of paranasal sinuses¹⁴ awoke the possibility of an endoscopic approach for the pituitary gland. Jankowski et al¹⁵ described the endoscopic endonasal removal of pituitary adenomas in three patients. Jho and Carrau further developed the pure endonasal endoscopic surgery of pituitary tumours¹⁶. The first Endonasal transphenoidal surgery for pituitary in Nigeria was carried out in Lagos in February 2009 by Kanu et al⁷ and based on authors knowledge no study has been carried out to review the presentation and surgical management of this disease using a minimal access approach. The aim of this study is to share our experience on the clinical presentation and surgical management of patients with pituitary adenoma using Purely EETSS access in our centre.

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METHODOLOGY

This is a retrospective review of all patient with pituitary tumours in Neurosurgery division and Otolaryngology Department between May 2012 – April 2018 who had EETSS. This involved the review of the clinic and the theatre register of both hospitals and retrieving the details of all patients with pituitary tumours who had EETSS. The case notes of the patients with sellar or supra sellar tumours who had EETSS were retrieved and required information were extracted from the case notes while patients who had prolactinoma or recurrent pituitary tumours were excluded from the study. A total of 18 patients had EETSS and were included in the study. Approval from hospital ethical review committee was taken before the

commencement of the review. Information retrieved from the case notes included the socio demographics, clinical features which includes otolaryngology or hormonal profiles, visual assessment reports which include the visual field, radiologic, the operative findings, the post-operative assessment, and histological results. All the patients had preoperative computerised tomographic scan and magnetic resonance imaging to evaluate the nasal and sphenoid anatomy in relation to the tumour as well as the size of the tumour and categorise them into either a macroadenoma (>1cm) or microadenoma (<1cm) as well as in planning the approach. All the patients had preoperative endocrine profile to classify the tumour into either a functional or non-functional adenoma and postoperative endocrine profile in some of the patient as well at follow up serum plasma growth hormone (GH), insulin like growth factor-I (IGF-I), prolactin (PRL), adrenocorticotropin hormone (ACTH), early morning cortisol, 24 hour urinary cortisol, thyroid stimulating hormone (TSH), T3, T4, leutinizing hormone (LH), follicle stimulating hormone (FSH), testosterone (T) and Estradiol (E2) levels were performed. Outcome and complications were documented with follow-up CT scan or MRI done 3 months after surgery for those patients that deteriorated. Preoperative and Postoperative visual assessment were done, endocrine function, radiologic evidence of resection and length of hospital stay. Postoperative complications found included syndrome of inappropriate antidiuretic hormone secretion (SIADH), diabetes insipidus (DI), cranial nerve palsy, ICA artery damage, CSF leak, headache, epistaxis, sinusitis, visual complications, pneumocephalus, meningitis, pan hypopituitarism and death. All information were entered into SPSS version 20, manual corrections were done and results were interpreted using frequency tables and percentages.

Equipment and Procedure

The set up included Endoscope Tower, Sinus Endoscopes (0°, 30°, 45°, 70°), Endoscope Irrigation system using 18G cannula with 20ml syringe for flushing, Endoscopic instruments. Under general anaesthesia, patients were put in supine position with head flexed at 20 degrees. Nasal packing was done with 10% xylocaine solution mixed with adrenaline in the ratio of 1:10,000 for 20 minutes. Endoscopic assessment of both nasal cavities to choose which side is wider. Using single nasal cavity approach the sphenoid recess and sphenoid ostium were also assessed. After identification of sphenoid ostium (Figure 1), a mushroom forcep was used to further expand the ostium, a long blade St Clair Thompson's forceps was used to fracture the posterior septum to expose the contralateral ostium then the two ostia were linked with size 1-3 Kerrison's Punch. The vomer with rostrum resected. After entering into sphenoid sinus, mucosa was removed and sellar floor identified with the presence of carotid protuberances, planum sphenoidale and clival recess. Sellar floor was drilled and dura was exposed. Dura was opened with sickle knife to visualize the tumour (Figure 3). Different sizes and sides of ring curettes were used to remove the tumour and also take biopsy. After central debulking, remaining tumour was sucked out. We used mainly 0-degree endoscope but 30 degree was used when needed to visualize the remaining tumour in lateral recess. After resection of the tumour (Figure 3), sellar floor reconstruction was done with bone pieces and stripped mucosal from the posterior part of the septum. Gloved finger nasal pack impregnated with hydrocortisone was inserted into both nasal cavities to support the sphenoid floor reconstruction and also maintain haemostasis.

RESULTS

A total of 18 Patients with diagnosis of non-secreting pituitary macroadenoma from different parts of Nigeria were included in the study during the period under review in both the Neurosurgery unit and ENT department. All the patients had purely EETSS during the period. There were 6 males (33.3%) and 12 females (66.7%) with M:F ratio of 1:2. Age range was between 31 – 64 years with bimodal peak age range at 31-40

years and 51-60 years and the mean age of presentation was 48.3 ± 1.5 years (Table 1). Duration of symptoms was between 1-11 years with a mean duration of 2.3 years. Major presenting symptoms were visual impairment in 15 (83.3%) which range from moderate to severe visual acuity. The pre-operative visual field defect showed both bi-temporal defect which had some symmetrical and asymmetrical patterns affecting mostly right than the left sides and unilateral defect which mostly affect the left side more than the right sides (Table 3). There was headache in 11 (61.1%), postmenopausal symptoms of flushing in 6 (33.3%) and amenorrhea with secondary infertility in 5 (27.8%). Radiologically majority of tumours were >3cm and were located in the sellar with supra-sellar extension in about 10 (55.6%) followed by sellar alone in 5 (27.8%) and sellar with para-sellar extension in 3 (16.7%). Gross Total Tumor Resection (GTR) was achieved in 14 (77.8%) of cases and sub-total Tumor Resection (STTR) in 4 (22.2%) of cases. Postoperatively there was improved visual acuity (Table 2) and visual field (Table 3) in 66.7% of the patients, while vision remain the same in about 11.1% and worsening of vision was observed in 5.6% of the patients. Four patients (22.2%) had postoperative MRI done because of postoperative deterioration out of which one had a repeated trans-sphenoidal surgery and another had transcranial resection of significant residual tumour. There were two deaths in the intensive care unit with a mortality rate of 11.1%; One patient had uncontrolled blood sugar despite insulin and uncontrolled hypertension under anaesthesia. Patient was co-managed with the endocrinologist but subsequently had cardiac arrest while the second patient had post-operative Intraventricular hemorrhage (IVH) despite the use of ethamsylate, surgicel and pressure pack with gelfoam intraoperatively. Patient had fresh whole blood transfused after grouping and cross match. Postoperative CT scan done revealed Intraventricular haemorrhage with expansion of the ventricles that necessitated the use of external ventricular drain to evacuate the haemorrhage, medications to maintain Intracranial pressure, blood pressure, and coagulation. Immediate complications observed were transient. DI was observed in 33.3% of cases and it resolved within 3-4 days of admission, 2 of the patients (11.1%) had CSF leak which was managed conservatively without lumbar drain others as in Table 4. Duration of hospital stay varied from 4 – 17 days with a mean hospital stay of 4.9 days and mean follow up period of 8 months. There was histological diagnosis of pituitary adenoma in 17 patients. One patient was reported as having malignant mucoepithelial tumour (Figure 2) and was referred for chemo-radiotherapy.

DISCUSSION

Disorders of the sellar region are frequently encountered in neurosurgical practice with pituitary tumour constituting about 10%- 15% of all intracranial tumors^{1,2}. In our study the tumour accounted for 10.5% of all the intracranial tumours in our centre which still fell within the ranges documented in the literature^{1,2,17}. The age range in our study was between 31 – 64 years compared to Kanu et al in Lagos south-western Nigeria that found 19 – 72 years but the peak age range and mean age were not reported in their study. The mean age of presentation in our study was 48.3 ± 1.5 years higher than other studies^{7,18} but lower than that reported by Chone et al¹⁹ in South America. In a study done in Romania there was no significant difference between sexes²⁰. In a large demographic study in US, it was observed that incidence rates increased with age and were higher in older males and younger females²¹. However our study reported higher incidence among the females more than the males in all age groups similar to some studies¹⁸. The commonest presentation among our patients was visual impairment or visual loss in 83.3% (table 2) and headache in 61.1% similar to reports from other centres both within and outside Nigeria^{18,22}. Most of our patients had pituitary macro adenoma resulting in compressive symptoms while only 11.1% had microadenoma based on the radiological review (Figure 4) of our patients similar to studies from Ethiopia and Kenya^{18,22}. Also from our studies majority of those with macro-adenoma had tumour extending beyond the sellar region and these may be responsible for the pressure symptoms such as headache, visual

loss which the patients presented with, similar to reports from other regions^{7, 23, 24}. Total tumour resection in our study was achieved in 77.8% of cases similar to report by Kanu et al in Nigeria⁷ although with a larger series however it is lower than report from Cuba and Brazil^{18,22,25} and sub-total resection from anaedoctal evidence may be responsible for poor vision or no changes observed in the vision of the patients compared to studies in the developed countries with almost 100% tumour resection.^{7, 10, 18, 20}. Postoperatively there was improved vision in more than 2/3rd of the patients, visual recovery in our study was influenced by the degree of visual acuity (table 2) and visual field loss (table 3) at the time of presentation and the time the patient had surgery as the cost of surgery and investigation is a challenge observed among patients because most of the expenses were out of pocket^{7, 10, 18, 20}. Patients without optic atrophy or those who presented early enough and who had surgery shortly after the diagnosis had better recovery in their vision whereas those in whom surgery was delayed or who had optic atrophy achieved little improvement^{7, 10, 18, 20}. With regard to complications, Nasal crust formation was the most frequently observed complication among patients, as the nasal cavity was the pathway to sphenoid ostium⁸ and the degree of crust formation was also found to reduce with subsequent ones. Other complications observed were transient DI observed in about one third of cases that resolved within 3-4 days of admission. Cerebral spinal fluid leak was also found in our study but not as much reported by others it was managed conservatively without lumbar drain^{7,8}. The CSF leak was encountered more frequently in cases of macroadenomas with suprasellar extension requiring opening of the subarachnoid space during the dissection. Other complications observed in our study were epistaxis and

synechiae formation in a case and was separated early enough with no sequelae. Duration of admission in our study varied from 4-17days with a mean stay of 4.9 days which is shorter compared to study by Kanu et al in Lagos⁷. Mortality rate of 11.1% was recorded in our study and they were due to uncontrolled blood pressure under anaesthesia and uncontrolled blood sugar despite insulin in a known diabetic patient while the second patient had clinical and radiological evidence of post-operative Intraventricular hemorrhage (IVH) and attempt at use of external ventricular drain to evacuate the haemorrhage failed, however medications to maintain Intracranial pressure, blood pressure, and coagulation were used.

CONCLUSION

Pituitary tumour is a common tumour among the middle age group with more females presenting affected. The commonest presentations were visual impairment and headache due to pressure effects and patients required surgical intervention. Most patients had macroadenoma and total tumor resection via the EETS is about 78%. The approach showed improve vision in 2/3rd of the patients, mean hospital stay was about 4.9 days with nasal crust formation being the most observed complication in our series and a mortality rate of 11.1%. This study has revealed that bilateral deterioration of central visual acuity and visual field is a relatively insensitive indicator of mass effect and correlates poorly with visual deficit. Thus, the need to have a pituitary tumour as one of our differentials. There is need for a prospective study on the benefit of minimal access approach to pituitary tumour using EETS access as its benefit outweighs its risk.

Table 1 Age –Sex Frequency Distribution

Age-Group (Years)	Male	Female	Total
31 – 40	2	4	06
41 – 50	0	1	01
51 – 60	4	5	09
61 – 70	0	2	02
Total	06	12	18
Mean age of Presentation = 48.3 ± 1.5years			

Table 2 Visual Acuity Assessment

Grading	Visual Acuity	Frequency (%) Preoperative	Visual Acuity	Frequency (%) Postoperative
No change in vision	6/6 – 6/12	3 (16.7%)	6/6 – 6/12	3 (16.7%)
Moderate Visual acuity	6/18 – 6/60	10 (55.6%)	6/12 -6/18	8 (44.4%)
Severe Visual Acuity	6/60 – 3/60	5 (27.7%)	6/18 -6/60	4 (22.2%)

Table 3 Visual field Assessment

Visual field Assessment	Frequency (%) Preoperatively	Postoperative
Bitemporal defect	8 (44.4%)	Reduced defect with widening of visual field bilaterally in 5 (27.7%)
Symmetrical	5 (27.8%)	
Asymmetrical	3 (16.7%)	
Unilateral defect	10 (55.6%)	Recovery of vision with improved visual field in 6 (33.3%)
Temporal hemianopia	6 (33.3%)	
Temporal quadratopia	4 (22.2%),	

Table 4 Complications from the Surgery

Complication	Frequency (%)
Excessive nasal crusting	10 (55.6%)
SIADH/Diabetes Insipidus	6 (33.3%)
Epistaxis	5 (27.8%)
Sinusitis	4 (22.2%)
Hyposmia/Anosmia	2 (11.1%)
Cerebrospinal fluid leakage	2 (11.1%)
Synaechiae formation	1 (5.6%)
Worsened Vision	1 (5.6%)
Intraventricular Haemorrhage	1 (5.6%)



Figure 1 Endoscopic Picture of the Right Sphenoid sinus opening

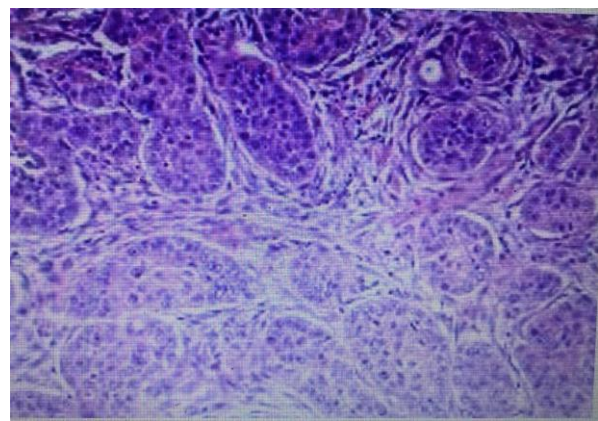


Figure 2 Histological Picture of malignant mucoepithelial tumour

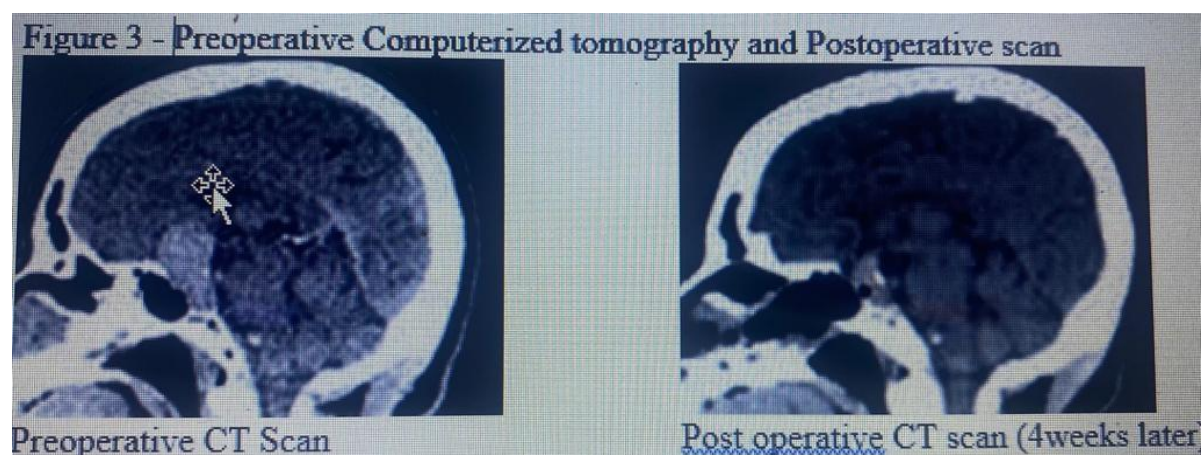


Figure 3 Preoperative and Postoperative Computerized Tomographic Scan of Patient

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