CLINICAL STUDY

EARLY EXPERIENCES WITH ENDOSCOPIC ENDONASAL TRANSSPHENOIDAL SURGERY

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SUMMARY

Objective: Pituitary tumors (PT) constitute 10-15% of intracranial tumors, and 90% of surgically treated PTs are pituitary adenoma (PA). PA can be treated using pharmacologic, surgical, and radiotherapeutic methods. Today, endoscopic endonasal transsphenoidal surgery (EETS) is more commonly performed because it is less invasive, provides a panoramic image, enables better evaluation of anatomic structures and adjacencies, and reduces hospital length of stay compared to other surgical methods. In this study, we evaluated the results of 21 patients who underwent EETS in our clinic.

Methods: A total of 21 patients who underwent EETS between 2016 and 2020 in our clinic were evaluated retrospectively. Thirteen (61.90%) of the patients were women, 8 (38.09%) were men, and the mean age was 53.71 (24-73) years.

Results: Pathology reports indicated pituitary adenoma in 17 patients, Rathke's cleft cyst in 3 patients, and hypophysitis in 1 patient. Rhinorrhea occurred in 3 patients, transient diabetes insipidus (DI) in 1 patient, and hypopituitarism in 2 patients. Two of the patients died.

Conclusion: The acquisition of endoscopic experience involves a learning curve in which there is initially a temporary high incidence of perioperative complications. Compared with the literature, our results are consistent with the beginning of the learning curve.

Keywords: Endoscopic endonasal transsphenoidal surgery, Complication, Learning curve Pituitary adenoma

ENDOSKOPİK ENDONAZAL TRANSSFENOİDAL CERRAHİDE ERKEN DÖNEM DENEYİMİMİZ

ÖZET

Amaç: Hipofiz tümörleri (HT) intrakranial tümörlerin %10-15'ini oluştururlar. HT'ü tanısı ile ameliyat edilen hastaların %90'ı hipofiz adenomudur (HA). HA'ların tedavisi farmakolojik, cerrahi ve radyoteropatik yöntemlerden oluşur. Endoskopik endonazal transsfenoidal cerrahisi (EETC) diğer cerrahi yöntemler ile karşılaştırıldığında daha az invaziv olması, panoramik görüntü sağlaması, anatomik yapıları ve komşulukları daha iyi değerlendirilmesi ve hastanede yatış süresinin kısa olması nedeniyle günümüzde daha sık uygulanmaktadır. Bu çalışmada, kliniğimizde EETC uygulanan 21 hastanın sonuçları değerlendirilmiştir.

Yöntem: Kliniğimizde 2016-2020 yılları arasında EETC'si uygulanan 21 hasta retrospektif olarak değerlendirildi. Hastaların 13'ü kadın (% 61,90), 8'i erkek (% 38,09), yaş ortalaması 53,71 (24-73) idi.

Sonuçlar: Toplam 21 hastanın patoloji sonucuna göre 17 hipofiz adenomu, 3 Rathke kleft kisti ve 1 hipofizit olarak rapor edildi. Hastalarda 3'ünde rinore, 1'inde geçici diabetes insipitus (DI) ve 2'sinde hipofizer yetmezlik gelişti. Hastaların 2'si eks oldu.

Sonuç: Endoskopik deneyim kazanmak için dik bir öğrenme eğrisi mevcuttur ve peroperative koplikasyonların insidansında başlangıçta geçici bir yükseklik söz konusudur. Bizim sonuçlarımız literatür ile karşılaştırıldığında öğrenme eğrisinin başlangıcında olduğu göstermektedir.

Anahtar Sözcükler: Hipofiz adenomu, Endoskopik Endonazal Transsfenoidal Cerrahisi, Komplikasyon, Öğrenme eğrisi

INTRODUCTION

Pituitary tumors (PT) constitute 10-15% of all intracranial tumors [1]. In autopsy series, this rate has been reported as 2-27%. Of the patients operated due to PT, 90% have pituitary adenoma (PA). Other causes include Rathke's cleft cyst, craniopharyngioma, metastatic carcinoma, chordoma, and meningioma [2]. PAs differ fundamentally from other intracranial tumors, mainly because they involve both oncologic problems and endocrine changes [1].

PAs are treated using pharmacologic, surgical, and radiotherapeutic methods. Surgery remains one of the most effective treatments. The first pituitary surgery was performed via a subtemporal approach by the British surgeon Paul in 1892. In 1907, Schloffer accessed the sella turcica via an extensive lateral rhinotomy-type incision, and this approach was further

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developed by Cushing in 1909. Guiot and Hardy described the foundations of the transsphenoidal approach used today in 1960. In the 1990s, endoscopic transsphenoidal surgery gained popularity [1,3]. Today, endoscopic endonasal transsphenoidal surgery (EETS) is more commonly performed because it is less invasive, provides a panoramic view, enables better evaluation of anatomic structures and adjacencies, and reduces hospital length of stay compared to other surgical methods [1,4].

In the present study, we evaluate the outcomes of 21 patients who underwent EETS in our clinic.

MATERIAL and METHODS

This retrospective study was performed after obtaining approval from the Sivas Cumhuriyet University non-interventional clinical research ethics committee (18.03.2020/2020-03/23). A total of 21 patients who underwent EETS between 2016 and 2020 in our clinic were evaluated retrospectively. These patients underwent a total of 27 EETS procedures, 2 of which were for recurrence, and 4 were rhinorrhea repair. The patients" age, sex, preoperative tumor size, postoperative complications, and pathology results were evaluated. Of the patients, 13 were women (61.9%), 8 were men (38.1%), the mean age was 53.7 years (24-73 years), and mean tumor size was 22.2 mm (5.3?50.0 mm) (Table 1).

All patients underwent contrast-enhanced dynamic pituitary magnetic resonance imaging (MRI), paranasal sinus computed tomography (CT), and visual field examination before surgery. The patients were also evaluated by specialists from the endocrinology and ophthalmology departments.

Postoperatively, the patients were evaluated in terms of hormone values, visual field, and dynamic contrast pituitary MRI on day one and at three months (Table 1, Figure 1). Tumor dimensions were evaluated according to Hardy classification (Table 1) [5].

Surgical Procedure

All patients underwent EETS without the use of a retractor (Figure 2) [6]. A 4-mm rigid endoscope with 0o view angle (Storz, Germany) was used. All operations were performed in collaboration with an otolaryngologist who carried out the nasal stages of the procedure. A uninostril approach was used, and nasal tamponade was applied in all cases. Five patients underwent resection of the concha bullosa, and 10 patients underwent septum surgery.

RESULTS

According to the 21 patients" pathology results, 17 (80.95%) were reported as pituitary adenoma, 3 (14.28%) were reported as Rathke's cleft cyst, and 1 (4.76%) was reported as hypophysitis (Table 1).

Three patients (14.28%) developed rhinorrhea as an early postoperative complication. Dural repair was performed using a fat graft, synthetic dura, and tissue glue. One (4.76%) of these patients developed a cerebrospinal fluid (CSF) fistula and underwent a second operation. One patient (4.76%) had transient diabetes insipidus (DI), two patients (9.52%) had panhypopituitarism, and one patient (4.76%) had nasal septum perforation. Two patients (9.52%) died, 1 of which (4.76%) due to meningitis and 1 (4.76%) due to thalamic infarction in the late postoperative period (Table 2).

Table 1: Demografik bilgiler

Cinsiyet	
Famale	13 (%61.90)
Male	8 (%38.09)
Yaş	24-73
	(53,71)
Tümör boyut (mm)	5,30- 50,00
	(22,23)
Patolojik tanı	
Hipofiz adenoma	17 (%80,95)
Rathke Kleft kisti	3 (%14,28)
Hipofizit	1 (%4,76)
Hardy Grade	
Sellar invasion	
Grade 0	1 (%4,76)
Grade I	1 (%4,76)
Grade II	2 (%9,52)
Grade III	4 (%19,04)
Grade IV	12 (%57,14)
Suprasellar extension	
Type 0	4 (%19,04)
Type A	10 (%47,61)
Type B	5 (%23,80)
Type C	2 (%9,52)
Type D	0

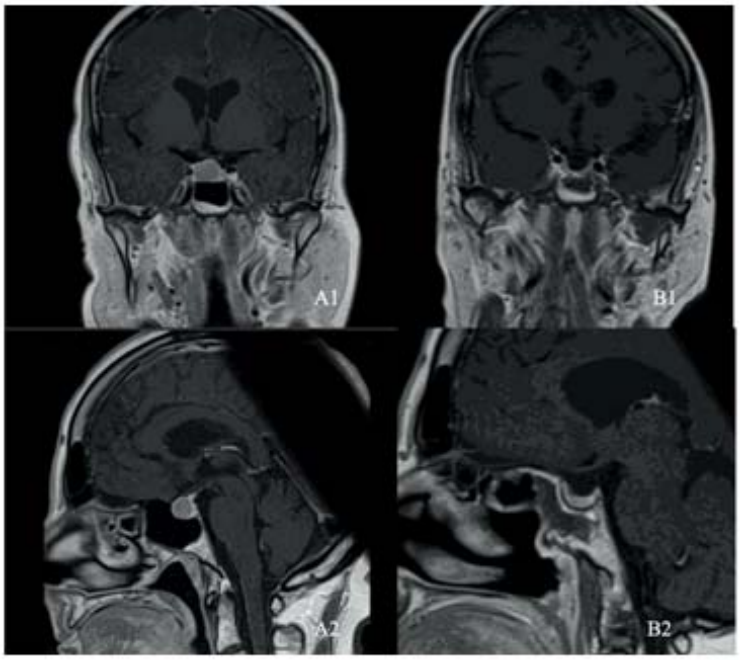

Figure 1: *Pre-postoperative MRI A1: preperative T1 coronal MRI A2: preoperative T1 sagital MRI B1: postoperative T1 coronal MRI B2: postoperative T1 sagital MRI*

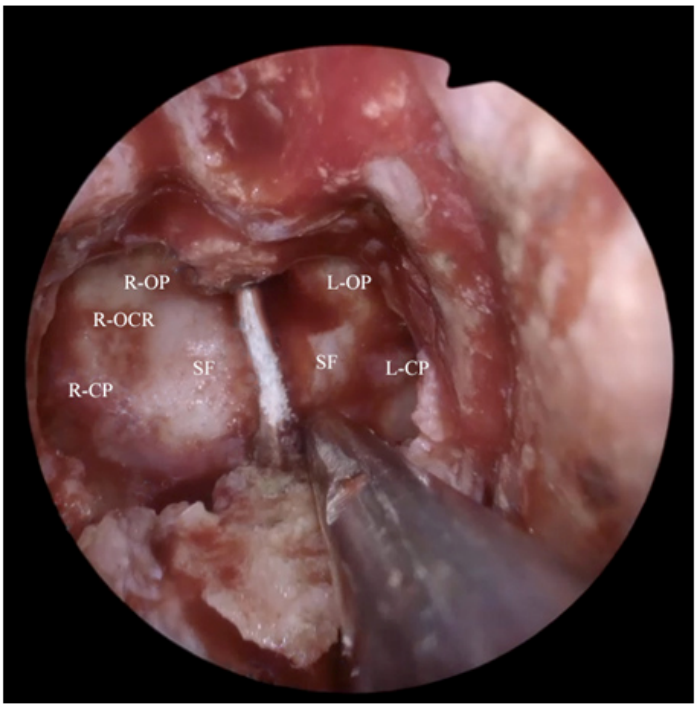

Figure 2: *Endoscopic view of the sphenoid sinus; R-OP right optic protuberance, R-CP right carotid protuberance, OCR opticocarotid recess, SF sellar floor, L-OP left optic protuberance, L-CP left carotid protuberance*

Tablo 2: Complications

Operative mortalite (30 days)	
Hypothalamic injury or hemorrhage	0
Menengitis	1 (%4,76)
Vascular injury or occlusion	1 (%4,76)
CSF leak or pneumocephalus	0
SAH or spasm, MI	0
Postoperative MI, postoperative seizure	0
Major Morbitidy	
Vascular occlusion, stroke, SAH or spasm	0
Vision loss (new)	0
Vascular injury (repaired)	0
Menengitis	0
Sellar abscess	0
6. CN palsy	0
3. CN palsy	0
CSF rhinorrhea	3 (%14,28)
Lesser Morbitidy	
Hemorrhage (intra or post operative)	0
Postoperative psychosis	0
Nasal septum perforation	1 (%4,76)
Sinusitis, wound infection	0
Transient CN (3, 6) palsy	0
Diabetes insipitus (usually transient)	1 (%4,76)
Cribriform plate fracture	0
Maxillar fracture	0
Hepatitis	0
Symptomatic SIADH	0

CSF Cerebrospinal fluid, **SAH** subaracnoid hemorrhage, **MI** myocard infactus, **CN** cranial nerve, **SIADH** syndrome of inappropriate antidiuretic hormone

DISCUSSION

Endoscopic endonasal transsphenoidal surgery has become a common procedure. It has replaced microscopic transsphenoidal surgery (MTS) because it is less invasive, provides a panoramic view that enables superior evaluation of anatomic structures and adjacencies, and results in shorter hospital stays [7]. Experience has an important role in reducing complications and ensuring the effectiveness of EETS. Endoscopic skills and two-dimensional visualization require a steep learning curve [8]. Different studies report that between 15 and 200 cases are required to achieve mastery [9]. According to Bokhari et al. and Shou et al., 30-40 cases are required to complete the learning curve [10,11].

In their meta-analysis, Fang et al. reported that nasal problems (upper lip anesthesia, nasal anesthesia, septum deviation, saddle nose, sinusitis, adhesion, and anosmia) occurred less frequently in EETS [7]. In other meta-analyses, no significant differences were found between endoscopic surgery and microscopic surgery in terms of complications (nasal problems are more common in microscopic surgery) or tumor removal [12].

All of our patients" operations were conducted in collaboration with an otolaryngologist. Only one patient (4.76%) had septum perforation. Lofrese et al. found that patients under multidisciplinary follow-up with a neurosurgeon and otolaryngologist were less likely to have late complications [9].

In their study, Bokhari et al. reported a 16?26% prevalence of endoscopic intraoperative CSF leak. This rate was higher in resections of aggressive tumors and increased by 7% in recurrence surgery. The prevalence of postoperative rhinorrhea was about 3% and was determined to be an important risk factor for meningitis [10]. In our study, CSF leak occurred in 3 (14.28%) of 21 patients, and rhinorrhea was detected in 1 patient (4.76%).

In a 331-patient series by Kim et al., the most common complication was transient DI (9.2%), and 3.0% of those patients were reported to develop permanent DI. Moreover, 5.4% of the patients had meningitis, 2.1% had syndrome of inappropriate antidiuretic hormone (SIADH), 2.4% had CSF leak, 2.4% had hemorrhage, and 0.6% had hydrocephaly. One patient (0.3%) died[13]. In the present study, one patient (4.76%) developed transient DI. In addition, one patient (4.76%) developed meningitis after CSF leak and later died. Another patient (4.76%) died due to late thalamic infarction.

In their study on 52 patients, Seltzer et al. repaired CSF leak intraoperatively in 5.6% of their patients, performed postoperative lumbar drainage on one patient (2.0%), and reported transient DI in 3 patients (5.8%), uniaxial hypopituitarism in 4 patients (10.5%), and new-onset panhypopituitarism in 1 patient (2.6%) [14]. In our study, two patients (9.52%) developed panhypopituitarism.

In another study on 28 patients, Ozalp et al. reported a 7.1% prevalence CSF leak. Pituitary insufficiency occurred in 7% of patients, and transient DI occurred in 10.7% of patients [15].

In their study on 100 patients, Kiraz et al. reported CSF fistule (0.5-15%), epistaxis (0.6%), transient DI (11.9%), and persistent DI (3.41%) in patients after EETS [16].

In a meta-analysis by Tabaee et al., the prevalence of CSF leak was 1?4%, DI was 0.5?15%, and the mortality rate was less than 1%[12]. In another meta-analysis, Fang et al. determined prevalence rates of 10.5% for CSF leak, 11.5% for DI, 1.7% for epistaxis, 1.8% for meningitis, 4.1% for hypopituitarism, 2.1% for septal perforation, and 1.6% for nasal problems (upper lip or nasal anesthesia, septum deviation, saddle nose, sinusitis, adhesion, and anosmia) [7].

In our preliminary series of 21 cases, some of our complication rates are consistent

with those reported in the literature, while others are higher. This is due to the small sample size and the fact that we are still at the beginning of the learning curve.

CONCLUSION

The acquisition of endoscopic experience involves a learning curve in which there is initially a temporary high incidence of perioperative complications. Compared with the literature, our results are consistent with the beginning of the learning curve.

REFERENCES

1. Jane Jr JA, Thapar K, Laws Jr ER, Pituitary Tumors: Functioning and Nonfunctioning Chapter 134. Youmans Neurological Surgery, Sixth Edition, Elsevier Saunders
2. Berker M, Hazer D B, Hipofiz adenomları, Türk Nöroşir Derg 2014, Cilt: 24,Ek Sayı: 3, 20-25
3. Carrau RL, Jho HD, Ko Y. Transnasal-transsphenoidal endoscopic surgery of the pituitary gland. Laryngoscope. 1996 Jul;106(7):914-8.
4. Tanrıverdi O, Günaldı Ö, Erkan B, Akbaş A, Adilay H. U, Çiftçi Doğanşen S, Endoskopik Hipofiz Cerrahisinda 200 Olguluk Deneyimimiz; Retrospektif Çalışma, İKSST Derg 2018; 10(3):117-121 doi:10.5222/iksst.2018.98704
5. Zubair A, M Das J. Transsphenoidal Hypophysectomy. 2020 Mar 10. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 Jan-. Available from http://www.ncbi.nlm.nih.gov/books/NBK556142/
6. Fang J, Xie S, Li N, Jiang Z. Postoperative Complications of Endoscopic Versus Microscopic Transsphenoidal Pituitary Surgery: A Meta-Analysis. J Coll Physicians Surg Pak. 2018 Jul;28(7):554-559. doi: 10.29271/jcpsp.2018.07.554. Review.
7. Koc K, Anik I, Ozdamar D, Cabuk B, Keskin G, Ceylan S. The learning curve in endoscopic pituitary surgery and our experience. Neurosurg Rev. 2006 Oct;29(4):298-305; discussion 305. Epub 2006 Aug 26. Erratum in: Neurosurg Rev. 2007 Jan;30(1):96.
8. Lofrese G, Vigo V, Rigante M, Grieco DL, Maresca M, Anile C, Mangiola A, De Bonis P. Learning curve of endoscopic pituitary surgery: Experience of a neurosurgery/ENT collaboration. J Clin Neurosci. 2018 Jan;47:299-303. doi: 10.1016/j.jocn.2017.09.011. Epub 2017 Oct 5.
9. Bokhari AR, Davies MA, Diamond T. Endoscopic transsphenoidal pituitary surgery: a single surgeon experience and the learning curve. Br J Neurosurg. 2013 Feb;27(1):44-9. doi: 10.3109/02688697.2012.709554. Epub 2012 Aug 17.
10. Shou X, Shen M, Zhang Q, Zhang Y, He W, Ma Z, Zhao Y, Li S, Wang Y. Endoscopic endonasal pituitary adenomas surgery: the surgical experience of 178 consecutive patients and learning curve of two neurosurgeons. BMC Neurol. 2016 Nov 30;16(1):247. PubMed Central PMCID: PMC5129667.
11. Tabaee A, Anand VK, Barrón Y, Hiltzik DH, Brown SM, Kacker A, Mazumdar M, Schwartz TH. Endoscopic pituitary surgery: a systematic review and meta-analysis. J Neurosurg. 2009 Sep;111(3):545-54. doi: 10.3171/2007.12.17635. Review.
12. Kim JH, Lee JH, Lee JH, Hong AR, Kim YJ, Kim YH. Endoscopic Transsphenoidal Surgery Outcomes in 331 Nonfunctioning Pituitary Adenoma Cases After a Single Surgeon Learning Curve. World Neurosurg. 2018 Jan;109:e409-e416. doi: 10.1016/j.wneu.2017.09.194. Epub 2017 Oct 7.
13. Seltzer J, Wedemeyer MA, Bonney PA, Carmichael JD, Weiss M, Zada G. Outcomes following transsphenoidal surgical management of incidental pituitary adenomas: a series of 52 patients over a 17-year period. J Neurosurg. 2018 Jun 1:1-9. doi: 10.3171/2017.11.JNS171485. [Epub ahead of print]
14. Mooney MA, Hardesty DA, Sheehy JP, Bird CR, Chapple K, White WL, Little AS. Rater Reliability of the Hardy Classification for Pituitary Adenomas in the Magnetic Resonance Imaging Era. J Neurol Surg B Skull Base. 2017 Oct;78(5):413-418. doi: 10.1055/s-0037-1603649. Epub 2017 Jun 7. PubMed Central PMCID: PMC5582963.
15. Özalp H, Kahiloğulları G, Seçinti KD, Tetik B, Bozkurt M, Meço C, Ünlü A, Hipofiz Cerrahisinde Endoskopik ve Mikroskobik Transsfenoidal Yaklaşımların Karşılaştırılması. Türk Nöroşirurji Dergisi. 2015, Cilt 25, Sayı: 1,27-37
16. Kiraz M, Günaldı Ö, Tanrıverdi O, Kına H, Yazıcı ZM, Mert M, Niyazoğlu M, Tuğcu B, Endoskopik Endonasal Transsfenoidal Cerrahi Yüz Olgunun Retrospektif Değerlendirilmesi. Sinir Sistemi Cerrahisi. 2015, Cilt 5, Sayı 1-2 doi:10.5222/sscd.2015.001