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Research Article

Endoscopic Transsphenoidal Surgery for Pituitary Tumor in Thailand: A review

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Abstract

Transsphenoidal surgery for pituitary tumor (PT) has been performed for many decades. Recent technology and endoscopic-related tools' refinement have allowed more complete resection yielding longer disease-free survival, if not a cure, while minimizing surgical morbidity/mortality. This novel surgical treatment has been in Thailand for approximately 20 years. The author reviewed published articles that were from centers in our country to describe the current status of endoscopic transsphenoidal surgery (eTSS) for PT in Thailand. There were a handful of sizeable case series that had been reported from prominent institutions in our country. These articles described various aspects of this procedure that would benefit young neurosurgeons to envision the next chapter of eTSS for PT in our part of the world. In addition, other specialties also contributed to invaluable publication related to this subject. Last, but not least, extraordinary case reports, with unique presentation, radiographic or pathology, that were not as uncommon as one would have imagined, were paramount to the pituitary disease community.

Keywords: endoscopic, transsphenoidal, pituitary, Thailand

บทคัดย่อ

การผ่าตัดเนื้องอกต่อมใต้สมองผ่านโพรงอากาศสฟีนอยด์ด้วยกล้องเอ็นโดสโคปในประเทศไทยปัจจุบัน

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การผ่าตัดเนื้องอกต่อมใต้สมองผ่านโพรงจมูกมีมานานหลายสิบปีแล้ว ความก้าวหน้าทางเทคโนโลยีที่ดีขึ้นเอื้อให้เกิดพัฒนาการผ่าตัดวิธีนี้โดยใช้กล้องเอ็นโดสโคปซึ่งในประเทศไทยมีการผ่าตัดเช่นนี้มาราว 20 ปีแล้ว บทความปริทัศน์นี้ได้รวบรวมหลักฐานเชิงประจักษ์จากหลายสถาบันในประเทศไทยที่เกี่ยวข้องกับการใช้กล้องเอ็นโดสโคปผ่าตัดเนื้องอกต่อมใต้สมองผ่านโพรงจมูก ผู้นิพนธ์มีความประสงค์ที่จะใช้บทความนี้เพื่อเป็นข้อมูลสำคัญเชิงวิชาการให้กับกลุ่มเป้าหมายหลักคือประสาทศัลยแพทย์รุ่นต่อไป และเป็นแรงบันดาลใจกับกลุ่มเป้าหมายที่จะมุ่งมั่นฝึกฝนทักษะผ่าตัด เก็บรวบรวมข้อมูลจากการผ่าตัดผู้ป่วยโรคนี้ รวมทั้งให้เห็นประโยชน์ที่เกิดจากความร่วมมือหลากหลายสหสาขาที่เกี่ยวข้อง โดยมีเป้าหมายเพื่อประโยชน์สูงสุดต่อการดูแลผู้ป่วยต่อมใต้สมองไทยและพัฒนาวงการประสาทศัลยศาสตร์ไทยก้าวต่อไปสู่สากล

คำสำคัญ: เอ็นโดสโคป, ผ่านโพรงอากาศสฟีนอยด์, ต่อมใต้สมอง, ประเทศไทย

Introduction

Pituitary tumor (PT) is one of the most frequently encountered neoplasms in neurosurgical practice. Surgical excision of PT remains the powerhouse with regards to histological diagnosis and symptom alleviation for affected patients. The most common operation for PT is performed via transsphenoidal route that directly attacks the tumor with little manipulation of the optic apparatus or the brain. For several decades, microscopic transsphenoidal surgery (mTSS) had been the standard of care and the treatment of choice for PT. It significantly enhances visualization for transsphenoidal access compared to the original use of headlight described by pioneers of this procedure.[1] Despite abandoning the utilization of endoscopy in transsphenoidal access, it was first described by Guiot in 1963. In the mid-1970, few centers reported the use of endoscopy as an "adjunct" to mTSS.[1,2] Almost 20 years thereafter, pure endoscopic use for transsphenoidal surgery began with a handful of articles from Europe and North America.[2] Over time, endoscopy has shown superior outcomes compared to mTSS.[3,4,5,6] In Thailand, the first report of mTSS in Thailand was narrated by Phonprasert et al in 1980.[7] Yet, it was not until after the turn of 21st century that the endoscopic transsphenoidal surgery (eTSS) began in our country. The author reviewed the literature related to eTSS from Thailand to provide current looks of the procedure.

Objective

Because of the increasing trend of eTSS for PT in our country as well as worldwide, it is the author's goal to gather publication from Thailand that were related to eTSS for PT. This review ought to give our neurosurgeons some insight for the nowadays status. In addition, it should be worthwhile if this article can inspire and encourage our young colleagues who wish to excel in this surgical procedure for the benefit of our nation for generations to come.

Methods

The author performed a peer-reviewed literature search, up to April 30, 2023, via Pubmed, Scopus, Ovid Medline database, Cochrane library and Google Scholar for keywords of "transsphenoidal", "endoscopic" and "pituitary tumor". Only publication written by Thai institutes, that were based on results from Thai patients, were included in this review. Articles without specific mentioning of eTSS for PT were excluded except for those from institutes where it had been known to perform this procedure during the period of their investigations.

Results

There were 22 published articles included for our review. Nine studies were retrospective cohorts of pure eTSS and 3 articles were results from the mixtures of eTSS and mTSS for PT. Three prospectively conducted researches were identified. Highlights or summary from the publication are narrated in the review section below. Additionally, there were 7 case reports of uncommon or unique features of PT.

Contents

Endoscopic Transsphenoidal Surgery for Pituitary Tumor in Thailand: A review

At the initial stage, utilizing primitive tools and unacquainted anatomy of sinonasal corridor to neurosurgeons, eTSS was quite difficult. Therefore, its early views, by some, were rather skeptical with controversial issues such as limited maneuverability into the deep and narrow corridor or difficulty obtaining hemostasis.[8] In 2014, a report comparing eTSS (n = 38) with key hole supraorbital craniotomy (n = 92) for PT observed more frequent complications in the eTSS group. Notwithstanding, the authors admitted that the lack of experience could have played an important role in this finding.[9] The effect of a learning curve of this technically demanding surgery was reiterated by another cohort of 220 eTSS for PT. Apart from utilizing sophisticated and specifically-designed endoscopic equipment, this article demonstrated that binostril access yielded favorable results, i.e., higher extent of resection (EOR) and less cerebrospinal (CSF) leakage, than the mononostril entry.[10] The same institute also reported the clinical results from an extracapsular dissection using "cottonswab" for PT. Their outcomes, from 100 patients, were in line with other published global data.[11] A recent article from Thammasat University showed better results by eTSS (n=138) for PT over mTSS (n=72) with similar rates of complications. Less blood loss, higher EOR and shorter hospital stay in the eTSS cohort was observed.[12] Another study from Prasat Neurological Institute examined the pituitary hormones after eTSS for PT. Of their 126 non-functioning PTs, eleven

patients had permanent diabetes insipidus after surgery. Out of 83 patients with intact preoperative pituitary hormones, two incidences of new postoperative adrenocortical hormone deficit (2.14%) and 3 incidences of thyroidal hormone deficit (3.61%) were found after surgical resection of PTs. Six of 45 patients (13.33%) had normalization of hormones that they initially lacked prior to eTSS. (13) Worth mentioning, these researches were all conducted in retrospective fashion that one could reasonably postulate a certain degree of selection bias as the possible factor resulting in various eTSS outcomes in patients with PTs. Table 1 summarizes eTSS studies in Thailand with at least 100 cases.

Table 1 Summary of endoscopic transsphenoidal surgery (eTSS) for pituitary tumor (PT) case series from hospitals in Thailand with at least 100 cases. (mTSS = microscopic transsphenoidal surgery, N = Numbers of eTSS cases)

	N	Objectives of the study	Important messages from the study
Hansasuta et al[10] (2018)	220	Effects of dedicated endoscopic instruments and bi- vs mononostril access to outcomes	Utilizing advanced endoscopic tools and binostril approach were associated with better outcomes.
Skulsampaopol et al[11] (2019)	100	Results by using cottonswab for extracapsular dissection	Utilizing cottonswab for extracapsular dissection was safe and simple. Comparable results with worldwide series.
Noiphithak et al[12] (2021)	138	Compare eTSS with mTSS	eTSS had better outcomes than mTSS
Keandoungchun et al[13] (2021)	126	Postoperative hormone outcome for non-functioning PT removal	Of the 83 intact preoperative hormones, five new deficiencies were observed. Of the 45 cases with preoperatively deficient hormones, six had normalization after eTSS

Other retrospective articles, with fewer than 100 cases of eTSS, had contributions to our country's knowledge regarding other facets of PT outcomes by this procedure. Thiabha et al observed two of 11 patients, after eTSS, whose residual PTs were discovered by intraoperative magnetic resonance imaging (MRI) despite surgeon's conclusion of complete PT resection. This report, again, had echoed the value of intraoperative MRI.[14] Wongsirisuwan et al found that, from 39 cases undergoing eTSS, the PT to pons ratio, in T2-weighted series of the preoperative MRI, was an indicator of satisfactory tumor removal.[15] A Study from Songklanagarind university hospital retrospectively examined 51 patients with acromegaly. Among them, either mTSS (n = 21) or eTSS (n = 30) for PTs were performed. While the micro- or endoscopic technique did not correlate with the success of disease remission, the high preoperative insulin-like growth factor 1 index ≥ 2.5 and high-grade cavernous sinus invasion were associated with non-remission.[16] The same institute reported their, mixed mTSS (n=36) and eTSS (n=62), outcomes for the treatment of pituitary apoplexy. Lower preoperative prolactin level and inferior invasion by higher

Wilson-Hardy grade were associated with poor recovery of hypopituitarism.[17] Ganokroj et al performed an analysis of growth hormone producing tumors although the authors did not specifically mention how many eTSS were executed in their cohort. However, it was known that this procedure was present for a certain duration, in the same hospital, of the study. With almost 70% of cases in remission, their treatment results were in line with global data.[18] Another article, from ophthalmology perspective, illustrated that the preoperative peripapillary retinal nerve fiber layer thickness correlated with postoperative visual functions after eTSS.[19]

With regard to prospective research, there was one study measuring copeptin level after hypothalamic-pituitary surgery, including 69 eTSS. It was discovered that the low copeptin level, within the first postoperative day, was related to the occurrence of diabetes insipidus.[20] Another prospective series from Khon Kaen University analyzed 44 patients' voice quality before and after eTSS for PT. No significant change of the subjective and objective data, pre- vs post-surgery, from these cases was observed.[21] A recent prospective randomized trial by anesthesiology group with specific aim for medication used during transsphenoidal surgery for PT. Despite not mentioning how many eTSS were performed in their cohorts of 80 cases, Dexmedetomidine infusion of 0.2 and 0.5 micrograms per kilogram per hour showed no different blood loss or hemodynamics. Shorter operating time and hypotension were observed in the higher dose group.[22]

Additionally, with many referrals to those centers, there had been unique presentations, or pathologies, of the pituitary conditions. Examples of these rarely encountered situations were metastases to pituitary gland[23,24] or metastases to PT[25, 26], pituitary tuberculoma[27], CSF leakage in an untreated non-functioning PT[28] or a ruptured aneurysm mimicking pituitary apoplexy.[29]

Discussions

The first case of eTSS for PT in Thailand was performed by Dr.Thirasak Puen-ngarm at Prasat Neurological Institute in 2003. (personal communication) Since then, the procedure has been popularized among Thai neurosurgeons, noticeable by the growing numbers of published documents as described in the review section. Owing to the evolution of advanced endoscopic tools as well as proper training from oversea or local mentors, this particular surgical skill for our neurosurgeons had been developed. Too, attending eTSS lectures, in combination with cadaver dissection workshops, or symposiums by invited foreign and local speakers greatly contributed to the popularization of the procedure. In addition to gaining hands-on experience and skill by more cases of eTSS for PT, enthusiastic neurosurgeons should thoroughly explore each cited article, into its individual details, in this review. Tremendous evidence-based information from these centers in Thailand should direct the path for future development in this field.

As evident by developed nations, high volume pituitary centers have been associated with better outcomes and relatively lower complications.[30] Therefore, the concept of Pituitary Center of Excellence (PTCOE) is essential for the maximal benefit of patients. The PTCOE should be an institute, where teamwork consists of interdisciplinary collaboration, with sufficient case load to maintain neurosurgeons' necessary skill

for eTSS. In addition, a multispecialty approach to pituitary disease is paramount for residency and/or fellowship training, development of new protocols or guideline elaborations.[31,32,33]

To date, most of the eTSS-related literature from our country have been retrospective studies. However, larger cohorts can be had with collaborations. The multidisciplinary team-effort for the treatment of PT offers ample research opportunities for other specialties. With significant caseload in these tertiary centers for pituitary disease, data are abundant for meaningful prospective investigations. Years to come, the author is confident that there would be more and more prospectively-conducted studies, from prominent institutes in Thailand, with new and important take-home messages by eTSS for PT. It is the author's hope that this review should encourage younger neurosurgeons to advance their education and to acquire necessary skill for the eTSS for the full benefit of our patients.

Conclusions

The insights of the current situation of eTSS for PT in Thailand is furnished by this review. This information should encourage the new-generation of keen neurosurgeons to develop their skill to continue the tremendous effort by our mentors to the point that we, as a nation, reach the comparable standard as developed countries. Last but not least, the author advocates systematic knowledge management, or national pituitary registry, of these eloquent data. This process will enable various aspects of researches to demonstrate our results that, one day, will be on par with international standards.

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