



ORIGINAL RESEARCH

FROM THE ANESTHESIOLOGIST'S PERSPECTIVE RETROSPECTIVE ANALYSIS OF PERIOPERATIVE COMPLICATIONS OF TRANSSPHENOIDAL PITUITARY SURGERY

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ABSTRACT

Objective: Pituitary surgery presents unique challenges for the anesthesiologist due to the distinct medical co-morbidities associated with various adenomas. The aim of this study was to investigate the perioperative complications throughout the transsphenoidal pituitary surgery from the anesthesiologist's perspective.

Methods: Retrospectively, 82 ASA physical status I-II patients, who underwent transsphenoidal surgery between 1st Jan 2002-1st Jan 2006, were included in the study. The following general information was recorded for each patient: demographic data, airway management, cardiovascular and electrocardiographic abnormalities, duration of procedures, pituitary pathology, and any complications during the perioperative period.

Results: After induction, four patients developed severe bradycardia and ventricular premature beats with bizarre QRS complex with hypotension, non-responsive to atropine and ephedrine. Three patients experienced intubation problems. In 12 patients, following submucosal injection, a hypertensive response was observed. Only two patients (2.4%) had experienced temporary diabetes mellitus after surgery. Overall, 21 patients (25.6%) experienced complications during the perioperative period of transsphenoidal pituitary surgery.

Conclusion: Anesthesiologists must be wary of the possibility of difficult intubation, hypertensive episode at the time of intranasal submucosal injection of vasoconstrictor-supplemented local anesthetic, and hemodynamic and electrocardiographic abnormalities related to the underlying overlooked cardiac pathologies at any time during surgery.

Keywords: Anesthesia, Cardiomyopathy, Complications, Difficult intubation, Transsphenoidal pituitary surgery

ANESTEZİST GÖZÜYLE TRANSSFENOİDAL HİPOFİZ CERRAHİSİNDE PERİOPERATİF DÖNEMDE GÖRÜLEN KOMPLİKASYONLARININ GERİYE DÖNÜK DEĞERLENDİRİLMESİ

ÖZET

Amaç: Pitüiter cerrahi adenomların tiplerine göre, farklılık gösteren morbiditeler nedeniyle anestezi doktoru için yoğun uğraş gerektiren girişimlerdir. Bu çalışmanın amacı, transsfenoidal cerrahi sırasında ortaya çıkan komplikasyonları anestezi doktorunun bakış açısıyla değerlendirmektir.

Yöntem: 1 Ocak 2002-1 Ocak 2006 tarihleri arasında transsfenoidal hipofiz cerrahisi geçiren ve ASA skoru I-II olan 82 hasta retrospektif olarak çalışmaya alındı. Her hasta için; demografik özellikler, havayolu sağlanması, cerrahi süre, kardiyovasküler ve elektrokardiyografik anormallikler, patolojik tanı ve perioperatif dönemde ortaya çıkan komplikasyonlar kaydedildi.

Bulgular: Anestezi indüksiyonunu takiben 4 hastada medikal tedaviye cevap vermeyen ağır bradikardi ve geniş QRS kompleksin eşlik ettiği ventriküler premature atımlar görüldü. Üç hasta entübasyon sırasında problem yaşadı. Oniki hastada ise submukozal enjeksiyon sonrasında hipertansif yanıt gözlemlendi. Erken postoperatif dönemde 2 hastada (%2.4) geçici diabetes insipid görüldü. Hastaların hiçbirinde rinore veya nazal kanama görülmedi. Bu bağlamda 21 hastada (%25.6) perioperatif dönemde komplikasyon oldu.

Sonuç: Anestezi uzmanlar zor entübasyon, vazokonstriktör eklenmiş lokal anesteziğin submukozal enjeksiyonuna bağlı hipertansif yanıt ve anestezi indüksiyonu sonrasında subklinik kardiyak patolojilerin klinik bulgu verir hale gelme olasılığını göz önünde bulundurmalıdır.

Anahtar Kelimeler: Anestezi, Kardiyomiyopati, Komplikasyon, Zor entübasyon, Transsfenoidal hipofiz cerrahisi

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INTRODUCTION

The pituitary gland has a very important role in human life. It regulates the function of the thyroid gland, the adrenal glands, the ovaries and the testes. Besides controlling lactation, uterine contractions during labor and the linear growth, it regulates the osmolality and volume of intravascular fluid by providing absorption of water in the kidney¹.

Tumors of the pituitary gland frequently originate from the anterior lobe. They account for approximately 10-15% of diagnosed brain neoplasms^{2,3}. Particular problems in such patients relate to primary hormonal hypersecretion and its complications, and mass effects of the macro adenomas. Although medical therapy is available for most hyperfunctioning states, it is not curative^{4,5}.

Transsphenoidal pituitary surgery has become common due to its safety and effectiveness in the management of various problems associated with the region of the sella turcica. Pituitary surgery presents unique challenges for the anesthesiologist due to the distinct medical co-morbidities associated with various adenomas. This retrospective study analyzed the correlation between the perioperative events and the pituitary pathology from the anesthesiologist's perspective.

PATIENTS AND METHODS

Retrospectively, 82 ASA physical status I-II patients, who underwent transsphenoidal surgery between 1st Jan 2002-1st Jan 2006, were included in the study.

Preoperative evaluation

Upon receiving the history and physical examination of the patient, the Mallampati classification, thyromental distance and mouth opening were evaluated in order to predict the possibility of difficult intubation. None of these patients had thyromental distance under 5 cm, Mallampati Class III-IV and mouth opening lesser than 1 cm as an indicator of difficult intubation⁶.

Preoperative blood levels of the growth hormone (GH), luteizing hormone (LH), follicle stimulating hormone (FSH), prolactin (PRL), adrenocorticotropin hormone (ACTH), and thyroid hormone levels (free T3 and T4) were measured. In the absence of known-cardiovascular pathology and electrocardiographic abnormality,

any further cardiovascular investigation was not conducted.

Anesthesia management

Standard anesthesia was applied to all patients: Normoventilation was instituted following loss of consciousness with IV remifentanyl 1 $\mu\text{g kg}^{-1}$ and propofol 1-2 mg kg^{-1} . Once an adequate mask airway was assured, IV vecuronium bromide 0.15 mg kg^{-1} , dexamethasone 0.2 mg kg^{-1} and ondansetron 0.1 mg kg^{-1} were administered. In case of inadequate mask airway ventilation, vecuronium bromide was not injected, and patients were intubated with or without 1.5 mg kg^{-1} succinylcholine. Anesthesia was maintained with 0.5% isoflurane 50% N_2O in O_2 and remifentanyl 0.25 $\mu\text{g kg}^{-1} \text{min}^{-1}$ infusion. Aspiration of postnasal blood drainage was prevented with a wet sponge placed into the oropharynx. During surgery, the lungs were normoventilated in order not to displace the pituitary gland with hyper- and hypo-ventilation.

At the end of the surgery, a three-point headrest was taken off. Remifentanyl infusion was stopped and the lungs were ventilated with 100% O_2 . The wet sponge was taken off from the oropharynx, and IV neostigmine 30 $\mu\text{g kg}^{-1}$ and atropine 10 $\mu\text{g kg}^{-1}$ were administered for the reversal of neuromuscular blockade. After spontaneous adequate respiration and the patient's response to the verbal comment was achieved, the lungs were extubated. The patient was reminded to breathe orally, as told before the operation. After 24-hour follow up in the Intensive Care Unit the patient was discharged on postop day 7.

Visual analogue scale was used for the evaluation of the patient's postoperative pain. Pethidine hydrochloride (Aldolan, Liba, Turkey) was titrated intravenously in order to keep the patient's score equal or below to 3.

Surgical management

After induction, the patient was positioned for surgery with the head fixed in a three-point headrest and secured with pins anchored into the cranium itself. To reduce venous engorgement, the operation table was adjusted to fifteen-degree Fowler position. After nasal cleaning, the patient received submucosal injections of 2 ml of 2% lidocaine and 1:100,000 epinephrine mixture to reduce bleeding and facilitate dissection. Then, transsphenoidal surgery was performed under



microscope and recorded on compact disc. Fatty tissue taken from the abdominal wall was placed onto the sella turcica. Nasal tampon was placed.

Data analysis

The following general information was recorded for each patient: demographic data, airway management (such as difficult intubation requiring more than three attempts and inability to intubate, etc.), duration of procedures, cardiovascular and electrocardiographic abnormalities, immunohistochemical diagnosis of pituitary pathology, and any complications during the perioperative period.

RESULTS

Eighty-two patients (39 female / 43 male) were included in the study. The mean age of the patients was 42.69 ± 14.63 years (range: 18-75 years). The mean operation duration was 105 ± 15 min. The patient distribution based on the pathologies and intraoperative complications, is provided in Table I.

After induction, three (20%) of the patients with GH secreting adenoma, and one (6%) of the patients with non-secreting adenoma developed severe bradycardia (range: 25-35 beat per min) and ventricular premature beats with bizarre QRS complex. Apart from cardiac arrhythmia, they were also slightly hypotensive. Blood pressure values in these patients were 40% lower than the previous value. Patients' cardiovascular statuses were non-responsive to the medical treatment with repeated doses of atropine and ephedrine. Twenty minutes after the induction of anesthesia, the patients' cardiovascular statuses did not show any

progress, therefore, surgery was cancelled, and the patients were awakened. Cardiology consultation revealed that these four patients had moderate cardiomyopathy.

In one (4%) of the patients with PRL secreting adenoma, intubation was attempted four times. The laryngoscopic appearance of the vocal cord was Cormack-Lehane grade IV. During these attempts, the patient never experienced hypoxia. Because a fiberoptic bronchoscope was not available, surgery was cancelled. In two (13%) of the patients with GH secreting adenoma, endotracheal intubation was achieved at the third attempt due to Cormack-Lehane grade III vocal cord appearance.

In 12 patients (14%), following submucosal injection, a hypertensive response was observed (Table I). The patients' blood pressure increased by 30%. In one patient, systolic blood pressure rose as high as 260 mm Hg. Esmelol and remifentanyl were used to control these increases in blood pressure. Nineteen patients (23%) had experienced intraoperative complications during transsphenoidal pituitary surgery.

After cessation of anesthetic agents, all patients responded to verbal comment within 5 min. And their lungs were extubated. None of the patients experienced nausea and vomiting during emergence from the anesthesia and the postoperative 24-hour Intensive Care Unit follow up. Only two patients (2.4%) had experienced temporary diabetes mellitus after surgery. Overall, 25.6 % of the 82 patients had experienced perioperative complications during the transsphenoidal pituitary surgery.

Table 1: The patients' demographic features, pathologies and intraoperative complications

Etiology	Pt. (n)	Intraoperative			Postoperative
		Hypertension	Cardiovascular Arrhythmias+Hypotension	Airway management Difficult* Enabled	Hormonal Temporary Diabetes Insipidus
Apoplexy	3				
Benign cystic Adrenocorticotrophic hormone secreting adenoma	2	1			
Plurihormonal secreting adenoma	11	3			1
Prolactin secreting adenoma	27	4		1	1
Luteizing hormone secreting adenoma	4	1			
Growth hormone secreting adenoma	15	1	3	2	
Null cell (non-secreting adenoma)	17	2	1		
Malignant melanoma	1				
Total	82	12	4	2	2

*: Difficult intubation was described as a case in that more than three attempts were needed for intubation of the trachea.



DISCUSSION

The perioperative care of patients presenting for pituitary surgery requires careful preoperative assessment and meticulous intraoperative management using principles common to all intracranial procedures⁷.

A safe airway supply is essential for the management of anesthesia. In literature, the incidence of difficult intubation shows great variability and ranges between 0.05 and 18%^{6,8,9}. In this study, overall incidence of difficult intubation was 3.9%, while in patients with GH secreting adenoma, its incidence increased to 13%. Excessive GH results in the coarsening of features with bony proliferation that can concomitantly involve macroglossia, prognathia with malocclusion and hypertrophy of soft tissues (esp. the tongue), epiglottis and aryepiglottis folds¹⁰. All these changes make tracheal intubation difficult in these patients. Colao et al¹¹ have shown that adolescents with prolactinoma have osteopenia or osteoporosis. In our study, the patient whose tracheal intubation could not be achieved had a problem at her neck due to the osteoporotic changes. Neck extension was limited to 30°. The patient was 50 years-old. These osteoporotic changes might be related to PRL secreting adenoma, not age. However, the literature does not provide information on increased incidence of difficult intubation in patients with PRL secreting adenoma¹¹.

In acromegalic patients, cardiac muscles are also affected, and the incidence and severity of cardiac hypertrophy is related to the duration of the disease⁴. After induction, three patients had experienced severe bradycardia ventricular premature beats with bizarre QRS complex and hypotension, non-responsive to the medical treatment with repeated doses of atropine and ephedrine. In the preoperative visit, these patients did not have any problems related to the cardiovascular system, and both auscultation and electrocardiographic findings were within normal range. Therefore, preoperative echocardiography was not planned. Our results showed that intraoperative incidence of clinically presented-cardiomyopathy was 13% in acromegalic patients, and overall incidence in patients who had undergone pituitary surgery was 2.4%. In the light of these results, routine echocardiography should be performed, particularly on acromegalic patients, to rule out the cardiac disorders.

Intranasal submucosal injection of vasoconstrictor-supplemented local anesthetics may result in a hypertensive episode, as in these 12 patients^{12,13}. All patients who underwent transsphenoidal pituitary surgery received a prophylactic dose of dexamethasone 0.2 mg kg⁻¹ IV at the induction of anesthesia. While acute, a synthetic corticosteroid injection may cause a side effect of systemic hypertension, the magnitude of which is typically small compared to the responses in these 12 cases^{14,15}. Chelliah et al¹⁶ reported a case of postoperative myocardial infarct related to the intraoperative submucosal epinephrine-induced hypertension. We believe that close proximity of the injection side of vasoconstrictor-supplemented local anesthetics to the hypothalamus-pituitary axis, results in the increase in the incidence tachycardia and hypertension even after a small dose.

In patients undergoing transsphenoidal surgery, balanced anesthesia with remifentanyl provides faster awakening time compared with high concentration of volatile anesthetics, without the risk of postoperative opioids respiratory depression¹⁷.

In conclusion, transsphenoidal pituitary surgery entails careful preoperative evaluation. The anesthesiologist must be wary of the possibility of difficult intubation, hypertensive episode at the time of intranasal submucosal injection of vasoconstrictor-supplemented local anesthetic and haemodynamic and electrocardiographic abnormalities related to the underlying overlooked cardiac pathologies at any time during surgery.

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