Perioperative Management of Endocrinal Emergencies

Essay

Submitted for partial fulfillment of Master Degree in Anaesthesia

Presented By

Kamal Hosny Youssef

M.B.,B.Ch. Faculty of Medicine, Ain Shams University

Supervised by

Prof.Dr. Ilham Abdel-Latif Siam

Professor of Anaesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Prof.Dr. Rasha Samir Abdel-Wahab Bondok

Professor of Anaesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Niven Gerges Fahmy

Lecturer of Anaesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain-Shams University
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المعالجة التخديرية لحالات الاعتلال الحاد للغدد الصماء

رسالة
توطئة للحصول على درجة الماجستير في التخدير

مقدمة من

كمال حسني يوسف

بكالريوس الطب والجراحة، كلية الطب، جامعة عين شمس

تحت إشراف

أ.د/ الهام عبد اللطيف صيام

استاذ التخدير و الرعاية الركزة و علاج الألم
كلية الطب، جامعة عين شمس

أ.د/ رشا سمير عبد الوهاب بندق

استاذ التخدير و الرعاية الركزة و علاج الألم
كلية الطب، جامعة عين شمس

د/ نيفين جرجس فهمي

مدرس التخدير و الرعاية الركزة و علاج الألم
كلية الطب، جامعة عين شمس

كلية الطب
جامعة عين شمس
٢٠١٦

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5-HIAA	5-hydroxyindoleacetic acid
ACTH	Adrenocorticotropic hormone
ADH	Antidiuretic hormone
AI	Adrenal insufficiency
CBC	Complete blood count
CgA	Chromagranin A
CVP	Central venous pressure
DKA	Diabetic Keto-Acidosis
DM	Diabetes mellitus
EMG	Electromyograph
FT3	Free triodothyronine
FT4	Free thyroxine
GCS	Glasgow coma scale
GH	Growth hormone
HbA_1C	Glycosylated haemoglobin
HHS	Hyperglycaemic Hyperosmolar State
HPA axis	Hypothalamic-Pituitary-Adrenal axis
LMWH	Low molecular weight heparin
MIBG	Meta Iodo Benzyl Guanidine
PA	Pituitary apoplexy

PCC	Phaeochromocytoma
PET	Position Emission Tomography
PTU	Propylthiouracil
TIVA	Total intravenous anaesthesia
TRH	TSH-releasing hormone
TSH	Thyroid Stimulating hormone
VAE	Venous air embolism
VRIII	Variable rate intravenous insulin infusion

INTRODUCTION

Although endocrine emergencies are often encountered in patients with a known endocrinopathy, the emergency may be the initial presentation in previously undiagnosed individuals. If these endocrine disorders are not rapidly identified or if specific treatment is delayed, significant complications or even death may occur ***(Shah and Lettieri, 2007).***

Pituitary apoplexy is a rare endocrine emergency which can occur due to infarction or haemorrhage of pituitary gland. This disorder most often involves a pituitary adenoma. Occasionally it may be the first manifestation of an underlying adenoma. Patients usually present with headache, vomiting, altered sensorium, visual defect and/or endocrine dysfunction ***(Ranabir and Baruah, 2011)***.

Thyroid storm is life threatening and represents an extreme manifestation of thyrotoxicosis with resultant end-organ dysfunction. The incidence of thyroid storm has been noted to be less than 10% of patients hospitalized for thyrotoxicosis; however, the mortality rate due to thyroid storm ranges from 20 to 30% ***(Nayak and Burman, 2006).***

Myxoedema crisis is a life-threatening extreme form of hypothyroidism with a mortality rate as high as 25–60% even with best possible treatment ***(Mathew et al., 2011).***

Diabetic ketoacidosis (DKA) and the hyperosmolar hyperglycaemic state (HHS) are the two most serious acute metabolic complications of diabetes. Most patients with DKA have type 1 diabetes; however, patients with type 2 diabetes are also at risk ***(Kitabchi et al., 2009).***

An Addisonian crisis marks an acute adrenocortical failure which can be caused by decompensation of a chronic insufficiency due to stress, an infarct or bleeding of the adrenal cortex and also abrupt termination of a long-term glucocorticoid medication ***(Martin et al., 2012).***

Phaeochromocytoma is a rare neuroendocrine tumour that arises from the cells of chromaffin system, including the adrenal medulla and ganglia of the sympathetic nervous system. Symptoms vary according to the predominant catecholamine secreted by the tumour ***(Dubey et al., 2014).***

Carcinoid crises are rare life-threatening events involving cardiac instability when carcinoid tumours release vasoactive peptides ***(Seymour and Sawh, 2013).***

AIM OF THE ESSAY

To review recommendations in managing emergencies resulting from functional disturbance of endocrine glands as pituitary, thyroid, adrenal glands and pancreas .

ANAESTHETIC MANAGEMENT OF PITUITARY GLAND EMERGENCIES

Anatomy of pituitary gland:

Anatomically, the pituitary gland is located in the sella turcica circumscribed by the sphenoid bone covered by the diaphragm sellae. The surrounding structures are the optic chiasma and hypothalamus superiorly, and the internal carotid artery and the third, fourth, fifth and sixth cranial nerves within the cavernous sinus laterally (figure 1). In the adult, it measures about 12 × 9 × 6 mm in diameter and 0.6 g in weight. The complex vascularization of the pituitary gland is through the hypothalamus to the pituitary gland, and it is the most irrigated region of the body as 0.8 ml/g/min ***(Chang et al., 2009).***

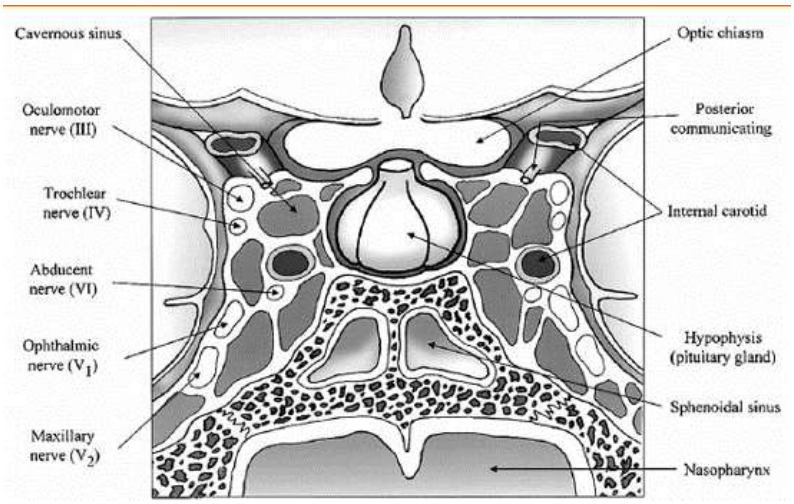

Figure 1*:* Coronal view of pituitary gland and surrounding structures ***(Alvarez, 2006).***

The blood supply of the normal pituitary gland comes from (a) a capillary network called 'hypophyseal portal system', originating from the superior and the inferior hypophyseal vessels in the infundibulum and (b) direct arterial blood supply from the 'superior hypophyseal arteries' for the anterior pituitary gland or the 'inferior hypophyseal arteries' for the posterior pituitary, originating from branches of the internal carotid artery. Importantly, the irrigation of the adenohypophysis predominantly comes from major portal vessels. Furthermore, it is important to know the existence of anastomotic vessels between the superior and the inferior hypophyseal circulation. The pituitary gland has a venous drainage to adjacent venous sinuses and then to the jugular veins ***(Chang et al., 2009).***

Hormones of the Pituitary Gland

Anterior Pituitary

- Follicle-stimulating hormone (FSH): Stimulates growth of follicles in the ovaries and sperm maturation in the testes.

- Luteinizing hormone (LH): Stimulates testosterone synthesis in the testes and synthesis of oestrogen and progesterone in the ovaries. LH also stimulates ovulation.

- Thyroid-stimulating hormone (TSH): Stimulates synthesis and secretion of thyroid hormones.

- Adrenocorticotropic hormone (ACTH): Stimulates synthesis and secretion of adrenal cortical hormones.

- Prolactin: Stimulates development of breasts and breast milk secretion ***(Zink, 2005).***

Intermediate Pituitary

- Melanocyte-stimulating hormone (small amounts are secreted by the intermediate lobe in humans): Involved in control of skin pigmentation ***(Zink, 2005).***

Posterior Pituitary

- Antidiuretic hormone (ADH): Increases absorption of water into the vascular space and increases blood pressure.

- Oxytocin: Contracts the uterus during childbirth and stimulates milk production ***(Zink, 2005).***

Pituitary apoplexy

Introduction:

Pituitary apoplexy (PA) is a rare endocrine emergency which can occur due to infarction or haemorrhage of pituitary gland. This disorder most often involves a pituitary adenoma. Occasionally it may be the first manifestation of an underlying