Highlight On Management Of Pituitary Gland Tumors

Essay

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List of Abbreviations

18F-FDG	18F-fluorodeoxyglucose
ACTH	Adrenocorticotrphic hormone
ADH	Antidiuretic hormone
CD	Cushing's disease
CNC	Carney's Complex
CNS	Central nervous system
CRH	Cortictropin releasing hormone
CSF	Cerebrospinal fluid
CT	computerised tomography
DA	Dopaminergic agonists
DI	Diabetes insipidus
FIPAs	Familial Isolated Pituitary Adenomas
FSH	Follicle stimulating hormone
GABA	γ-aminobutyric acid
GCT	Granular cell tumor
GH	Growth hormone
GHRH	Growth hormone releasing hormone
GKS	Gamma knife surgery
GnRH	Gonadotropin releasing hormone
ICA	Internal carotid artery
ICP	Intra-cranial pressure
IGF-I	Insulin-like growth factor I
IGP	invasive giant prolactinoma
IH	idiopathic hyperprolactinemia

IHC	Immunohistochemistery
LH	Luteinizing hormone
MEN	Multiple Endocrine Neoplasia
MRI	Magnetic resonance imaging
NFA	Non functioning adenoma
PET	Positron emission tomography
PONV	Postoperative nausea and vomiting
PRL	prolactin
PRLomas	prolactinomas
SCAs	silent corticotroph adenomas
SIADH	Syndrome of inappropriate antidiuretic hormone secretion
SST	Somatostatin
TRH	Thyrotropin-releasing hormone
TSH	Thyroid stimulating hormone
TSHomas	Thyroid stimulating hormone secreting adenoma
TSS	Trans-sphenoidal surgery

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Aim Of The Work

This Essay will help on the review of different modalities in the diagnosis and treatment of pituitary tumors outlining the recent advances in management. This will help us to compare different modalities to reach the best one in management of different pituitary tumors.

Introduction

The pituitary gland is composed of a larger anterior and smaller posterior lobe,the latter connected by the hollow infundibulum (pituitary stalk) to the tuber cinereum in the floor of the 3rd ventricle. The two lobes are connected by a narrow zone termed the pars intermedia. The pituitary lies in the cavity of the pituitary fossa covered over by the diaphragma sellae, which is a fold of dura mater. This fold has a central aperture through which the infundibulum passes. Regarding relations of pituitary gland the body of the sphenoid lies below the gland, laterally lies the cavernous sinus and its contents separated by dura mater with intercavernous sinuses communicating in front,behind and below. The optic chiasma lies above, immediately in front of the infundibulum ***(Ellis H, 2006).***

The anterior and posterior pituitary lobes form concurrently and continue to interact closely despite the different embryologic origin of the two tissues. The adenohypophysis contains six different cell types that are characterized by their hormone secretion: corticotrophs secrete adrenocorticotropic hormone or corticotropin (ACTH), somatotrophs secrete growth hormone (GH), thyrotrophs produce thyroid-stimulating hormone or thyrotropin (TSH), gonadotrophs secrete luteinizing hormone (LH) and follicle-stimulating hormone (FSH) and lactotrophs produce prolactin (PRL). The posterior pituitary lobe contains axonal terminals from the magnocellular hypothalamic neurons which are surrounded by pituitocytes(astroglia); oxytocin and vasopressin are peptide hormones that are synthesized by the magnocellular neurons and transported to the axonal terminals in the posterior lobe from where they are secreted to the general circulation ***(Keil MF and Stratakis CA, 2008)***.

Recent data suggest that 1 of 5 individuals in the general population is affected with a pituitary adenoma. Many of these neoplasms are clinically non-functioning adenomas that may be small and clinically undetected or may present as mass lesions; others are hormonally active and cause significant morbidity due to the metabolic effects of hormone excess (e.g., acromegaly and cushing's disease). In either case, they can grow and invade adjacent anatomic structures ***(Mete O and Asa SL,2013)***.

Recent epidemiological data suggest that clinically apparent pituitary adenomas have a prevalence of approximately one in 1,000 people in the general population ***(Daly etal.,2007).***

According to the 2004 WHO classification, pituitary tumors are defined as neoplasms located in the sella turcica. Adenomas deriving from adenohypophysial parenchymal cells are classified as typical adenomas or atypical adenomas. In very rare cases, they represent pituitary carcinomas. Pituitary carcinomas are characterized by the presence of metastases. Pituitary adenomas are also classified according to the size. Microadenomas are less than 10 mm in size, whereas macroadenomas have an estimated diameter of at least 10 mm. Most importantly, pituitary adenomas are classified by their similarity to normal parenchymal cells and the expression of specific pituitary hormones ***(Saeger W etal.,2007)***.

Pituitary adenomas cause symptoms by producing endocrinopathy (either hypersecretion in functional secreting prolactinemia, or hyposecretion from compression of the normal gland), or by direct mass effect on surrounding structures, such as the optic chiasma resulting in visual loss ***(Couldwell WT and Albright LC, 2010).***

Pituitary carcinomas are a very rare neoplasm . Most are ACTH- or PRL-secreting tumors. GH-positive or inactive tumors develop rarely into

carcinomas. Most pituitary carcinomas develop from invasive relapsing adenomas ***(Flitsch J etal.,2005).***

All patients with pituitary tumors should be evaluated for gonadal, thyroid and adrenal function as well as PRL and GH secretion. Specific stimulation and suppression tests for pituitary hormones are performed in selected situations for detecting the type of hypersecretion or the response to treatment. Imaging procedures (mainly magnetic resonance imaging, MRI, nowadays) determine the presence, size and extent of the lesion ***(Chanson and Salenave, 2004).***

Treatment modalities of pituitary tumors depends on clinical presentation, and they aim for tumor volume diminution, normalization of hormone hypersecretion, and preservation of normal pituitary function. Surgery, medication (dopamine agonists, somatostatin analogs, growth hormone receptor antagonists) and radiotherapy are used. The choice of treatment depends on hormone hyperproduction (prolactin or growth hormone), the size and invasion of the tumor, presence of visual impairment, the presence of associated comorbidities, the response or lack of response to medical treatment, contraindications, and the patient's preference ***(Syro etal., 2012).***

Diagnostic advances have resulted in earlier and more frequent recognition of pituitary tumors. the recent advances of the diagnosis and management of pituitary tumors include biochemical and radiologic diagnosis, transsphenoidal surgery, radiation therapy and medical therapy ***(Aron etal., 2005)***.

Anatomy

The pituitary gland, also known as the hypophysis, is located at the base of the brain. It is comprised of two very different glands: the anterior pituitary and the posterior pituitary. Each gland has a unique link to the hypothalamus. The posterior pituitary is linked to the hypothalamus via nerve tracts, and the anterior pituitary is linked to the hypothalamus via blood vessels ***(Jarvis , 2008).***

Embryology of the pituitary gland:

The pituitary gland forms around the middle of the fourth embryonic week from an invagination of the oral ectoderm (stomodeum) to the rudimentary primordium (Rathke's pouch). By the fifth week, the pouch has elongated and constricts at the attachment to the oral epithelium; the adenohypophysis (pars anterior, pars intermedia, and pars tuberalis) develop from the ectoderm of the stomodeum. The neurohypophysis develops from the neuroectoderm (infundibulum) ***(Davis SW et al , 2013).***

With further development, cells in the anterior wall of Rathke's pouch (pars distalis) proliferate rapidly and form the anterior lobe of the pituitary gland, also known as the adenohypophysis Differential growth of these cells relative to the surrounding mesenchyme produces a small basin, open above and separated into two compartments by a cellular median septum. Each compartment, or fossa of Atwell, is initially filled with mesenchyme. These fossae subsequently disappear as a result of further cellular proliferation by Rathke's pouch derivatives. The median septum forms the pars medialis, whereas the lateral portions form the pars lateralis of the anterior lobe ***(Amar AP and Weiss MH , 2003).***

Migration of mesenchymal elements from the fossae of Atwell to the anterior surface of the infundibulum carries the mesodermal elements that eventually form

the blood vessels of the hypophyseal portal system. A small extension of the median septum, the pars tuberalis, develops from the fusion of paired wing-like buds that grow along the stalk of the infundibulum and eventually encircle it. Cells of the posterior wall of Rathke's pouch do not proliferate extensively but differentiate into the middle lobe of the pituitary gland, the pars intermedia. The infundibular process gives rise to the posterior lobe of the pituitary gland, also known as the pars nervosa or neurohypophysis ***(Amar AP and Weiss MH , 2003).***

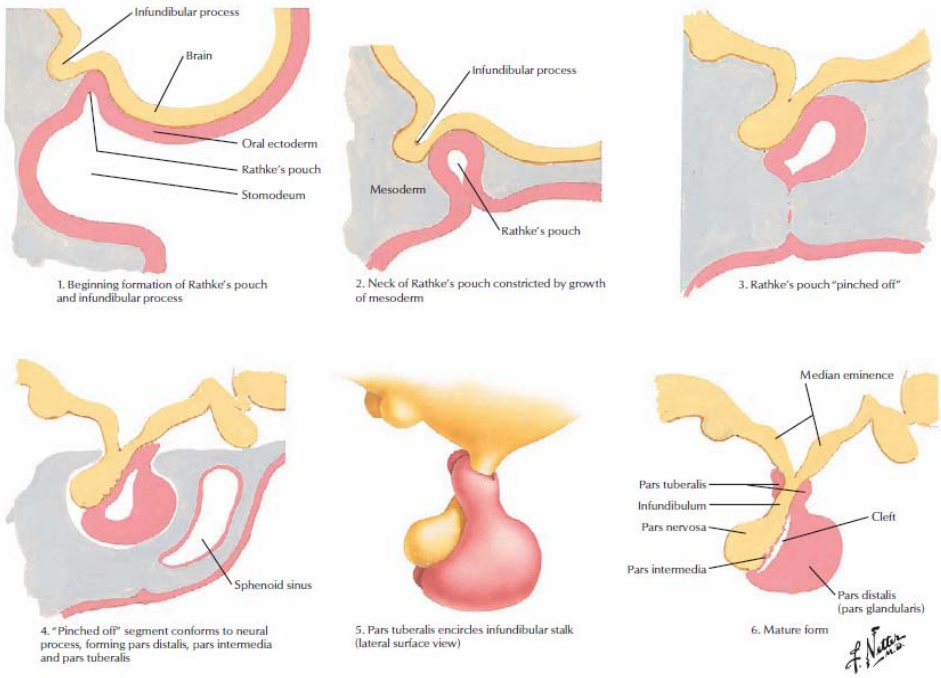

Figure (1-1) Development of the Pituitary Gland ***(Netter FH, 2012).***

Parts of the pituitary gland:

The pituitary gland (hypophysis) is composed of the neurohypophysis (posterior pituitary lobe) and adenohypophysis (anterior pituitary lobe). The neurohypophysis consists of three parts: the median eminence of the tuber cinereum, infundibular stem, and infundibular process (neural lobe). The adenohypophysis is likewise divided into three parts: the pars tuberalis, pars intermedia, and pars distalis (glandularis) ***(Young WF ,2011).***

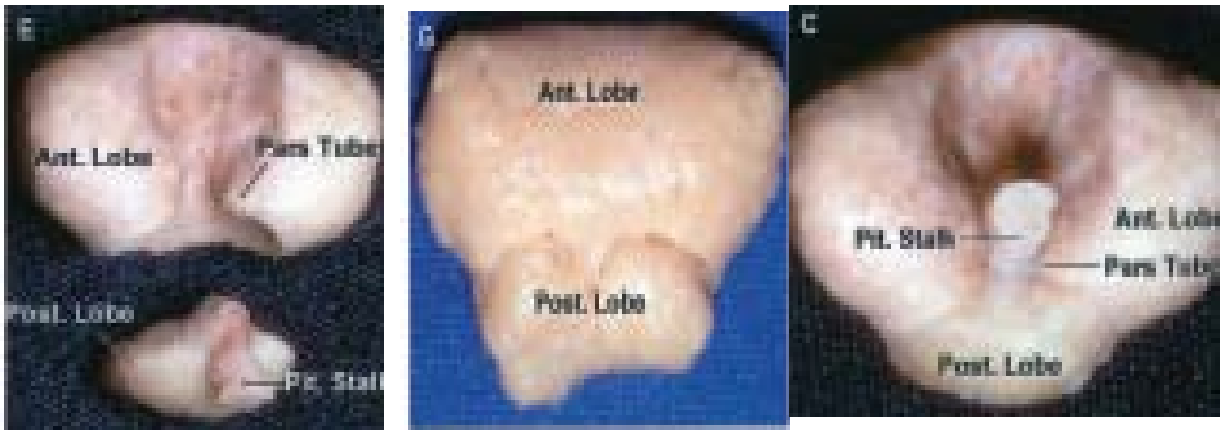

Figure (1-2) parts of pituitary gland ***(Rhoton,2007).***

Gross anatomy of the pituitary gland:

The average weight of the pituitary gland at birth is about 100 mg. Rapid growth occurs in childhood, followed by slower growth until the adult weight (approximately 500–600 mg) is attained in the latter part of the second decade.

The adult hypophysis measures approximately 10 mm in length, 10 to 15 mm in width, and about 5 mm in height. On average, the female gland is almost 20% heavier than the male gland primarily because of relative differences in the size of the pars distalis. Furthermore, the weight of the gland increases by 12% to 100% during pregnancy because of enlargement of the pars distalis ***(Aron et al ,1997).***