International Journal of Anatomy and Research,
Int J Anat Res 2017, Vol 5(4.1):4469-73. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2017.376

Original Research Article

HISTOGENESIS OF HUMAN FOETAL PITUITARY AT VARIOUS GESTATIONAL AGES

S. Babu Rao *[1], G. Geetha vani [2], V. Subhadra Devi [3].

[*1] Assistant professor, Department of Anatomy, Santhiram Medical College, Nandyal, Andhra Pradesh, India.

[2] Assistant professor, Department of Physiology, Santhiram Medical College, Nandyal, Andhra Pradesh, India.

[3] Professor and Head, Department of Anatomy, Padmavathi Womens Medical College, Tirupati, Andhra Pradesh, India.

ABSTRACT

Introduction: Pituitary gland is the master endocrine gland known for its cellular diversity. The different cells of pituitary will control different endocrine glands through their secretions. The differential cellular study of pituitary is important in understanding various diseases that result from hypo or hyper secretion. This study aims to observe various histological aspects of pituitary at different gestational ages.

Materials and Methods: A total of 100 apparently normal dead aborted embryos and fetuses of both sexes of 12 to 40 weeks gestational age were utilised for the histological study. The pituitary glands were removed and subjected to routine Haematoxylin & Eosin procedure. The specimen were categorised and observed for histogenesis of pituitary at various gestational ages.

Results and Conclusion: All the cell types of anterior lobe except lactotrophs are observed at 14 weeks of gestation. Incompletely formed portal vessels are also seen. At 19 weeks, acidophils predominate in lateral region whereas basophils predominated in middle region. At 24 weeks, the cells of anterior lobe are fully differentiated with the appearance of lactotrophs. Well developed portal vessels are observed. At term, acidophils are comparatively greater than basophils indicating probably lactotroph hyperplasia due to high maternal oestrogen levels.

KEY WORDS: Acidophils, Basophils, Chromophobes, Pituicytes.

Address for Correspondence: Dr. Babu Rao Sake, Assistant Professor, Department of Anatomy, Santhiram Medical College, NH-18, Nandyal-518501, Andhra Pradesh, India. Phone: 9247172669
E-Mail: baburaosake@gmail.com

Access this Article online

Quick Response code

DOI: 10.16965/ijar.2017.376

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 26 Jul 2017
Peer Review: 27 Jul 2017
Revised: None

Accepted: 05 Sep 2017
Published (O): 01 Oct 2017
Published (P): 01 Oct 2017

INTRODUCTION

The histology of pituitary is important for its wide variety of cells. It usually consists of a capsule, an adenohypophysis and a neurohypophysis. The capsule surrounds the pituitary gland and is derived from the meninges [1].

It is delicate and is adherent to the meninges of hypophyseal fossa. The parenchyma of adenohypophysis consists of cells arranged in the form of nests, cords, and small acini bounded by an interlacing capillary network. This architectural pattern, altered in hyperplasia and conspicuously absent in adenomas, is of considerable diagnostic significance [2].

The pars intermedia, a subdivision of adenohypophysis, consist of a large portion of epithelium-lined spaces filled with colloid. Incidental Rathke's cleft remnants of microscopic size are present in 30% of pituitaries especially in pars intermedia [3].

The cells of adenohypophysis are mainly of two types based on their staining affinities for acidic and basic dyes. They are A] chromophobes and B] chromophils. Chromophobes include 50% of the cells presenting agranular cytoplasm [4]. They lack affinity for either of the acidic or basic dyes. Chromophils include remaining 50% of the cells of which 40% are acidophils and 10% are basophils [4]. Acidophils and basophils reflect their staining affinities for acidic and basic dyes respectively. Both acidophils and basophils can be divided into subtypes on the basis of size and shape of the granules present in them. Acidophils constitute somatotrophs and lactotrophs whereas basophils constitute corticotrophs, thyrotrophs and gonadotrophs. Somatotrophs secrete growth hormone while lactotrophs secrete prolactin. On the other hand, corticotrophs secrete ACTH and MSH, thyrotrophs secrete TSH and gonadotrophs secrete FSH and LH.

The neurohypophysis consists of infundibulum, pituitary stalk, and posterior lobe. The posterior lobe consists of unmyelinated axons originating from the supraoptic and paraventricular nuclei of the hypothalamus, an extensive vascular network, and specialized glial cells termed pituicytes [2]. Pituicytes appear to exist in five principal forms: major, dark, ependymal, oncocytic, and granular [5]. Knob like axonal dilatations, known as Herring bodies, represents accumulations of posterior lobe hormones such as oxytocin and vasopressin.

No major studies were seen regarding the histological changes in fetal pituitary at progressive gestational ages. The present study aims to observe various histological changes that occur in fetal pituitary during the entire gestational period.

MATERIALS AND METHODS

The present study is of cross-sectional descriptive type, conducted in the department of Anatomy with the co-operation of Department of Obstetrics and Gynaecology. Institutional ethics committee approved collection of dead aborted embryos and fetuses of both the sexes after obtaining informed consent from the parents. This includes 100 apparently normal dead aborted fetuses of both sexes ranging from 12-40 weeks of gestational age.

Immediately they were preserved in 10% formalin. The pleural, peritoneal and orbital cavities were injected with 10% formalin and peripheral parts by multiple injection technique. After four weeks preservation, the cranial cavity was opened and the brain was removed as described by Romanes G. J (1986). After the removal of brain, the diaphragmma sella was incised radially and the pituitary was dislodged from the hypophyseal fossa. The pituitary glands were collected, labelled and subsequently preserved in 10% Formalin.

The collected specimen were categorized in to six groups viz., 11-15 weeks, 16-20 weeks, 21-25 weeks, 26-30 weeks, 31-35 weeks and 36-40 weeks based on gestational age. Few samples from each group were subjected to routine Haematoxylin & Eosin staining procedure. The sections were observed under 4x, 10x and 40x of light microscope and the fields were photographed using photomicrographic equipment and the results were analysed.

RESULTS

A total of 100 apparently normal dead aborted embryos and fetuses of both sexes of 12 to 40 weeks gestational age were utilized for observing the histological features of pituitary. The collected specimen were categorized in to six groups viz., 11-15 weeks, 16-20 weeks, 21-25 weeks, 26-30 weeks, 31-35 weeks and 36-40 weeks based on gestational age (Table. 1)

Table 1: Age wise and sex wise distribution of prenatal cadavers with percentage.

Gestational age (wks)	Male	Female	Total number with percentage distribution
11-15	0	4	4
16-20	9	12	21
21-25	10	14	24
26-30	14	13	27
31-35	7	7	14
36-40	5	5	10
Total	**45**	**55**	**100**

Few samples from each group were subjected to routine histological processing for H & E. The sections were observed under 4x, 10x and 40x of light microscope. The observations at different gestational ages were as follows:

At 14 weeks connective tissue capsule surrounding the gland is observed (Fig.1). The differentiation of anterior lobe and posterior lobe with intermediate lobe in between is observed (Fig.1). Hypophyseal cleft in between the anterior lobe and intermediate lobe is noted (Fig.1). A gap between the intermediate and posterior lobes is also seen (Fig.1).

Irregular clusters of epithelial cells in the form of nests or cords supported by connective tissue frame work are observed in anterior lobe (Fig.2). Incompletely formed portal vessels are seen in anterior lobe (Fig.2). Cysts without colloid are observed in intermediate lobe (Fig.3). Pituicytes are observed but not clearly in posterior lobe (Fig.3).

At 19 weeks the gap between the intermediate and posterior lobes that was observed at 14 weeks disappeared (Fig.4). The cells of anterior lobe showed differential staining for eosin and haematoxylin. Eosin stained cells predominate in lateral region and haematoxylin stained cells in middle region (Fig.4). Cysts without colloid are still seen in intermediate lobe (Fig.5). Pituicytes with nerve fibre tracts are clearly observed in posterior lobe (Fig.5).

At 24 weeks the cells of anterior lobe are fully differentiated. Well developed portal vessels are observed (Fig.6). Colloid filled cysts are observed in intermediate lobe (Fig.7).

At term, the cells of pituitary gland are clearly distinguishable into eosin and hematoxylin stained cells in addition to the features discussed above. Eosin stained cells predominate in lateral regions of anterior lobe and includes somatotrophs and lactotrophs (Fig.8). Hematoxylin stained cells predominate in middle region of anterior lobe and includes corticotrophs, thyrotrophs and gonadotrophs (Fig.8). Eosin stained cells are comparatively greater than hematoxylin cells indicating probably lactotroph hyperplasia (Fig.8). Intermediate lobe shows cysts filled with colloid and lined by corticotrophs (Fig.9).

Fig. 1: H&E 4x-14wks – Fetal pituitary gland; C-Capsule ; AL-Anterior lobe; IL-Intermediate lobe; PL-Posterior lobe; HC-Hypophyseal cleft; G-Gap.

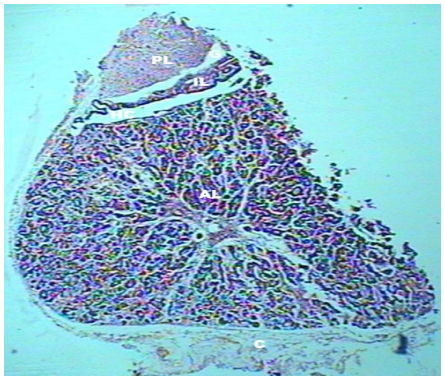


Fig. 2: H&E 40x-14wks- Anterior lobe of fetal pituitary gland; CC-Cords of cells ; NC-Nests of cells; PV-Portal vessels.

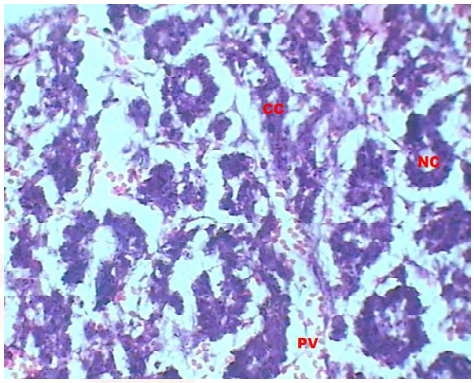


Fig. 3: H&E 40x-14wks- Cysts (CY) without colloid in intermediate lobe (IL) and pituicytes (P) in posterior lobe (PL) of fetal pituitary gland.

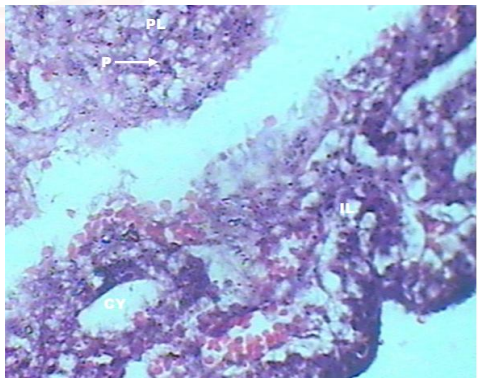


Fig.4: H&E 4x-19wks- Fetal pituitary gland showing the obliteration of gap (OG) between intermediate (IL) and posterior lobes (PL).

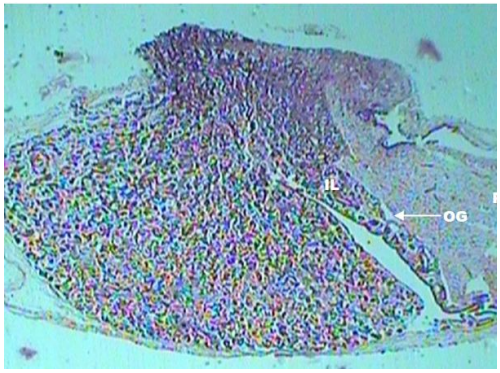


Fig. 5: H&E 40x-19wks- pituicytes (P) with nerve fibre tracts in posterior lobe (PL) ; CY-cysts.

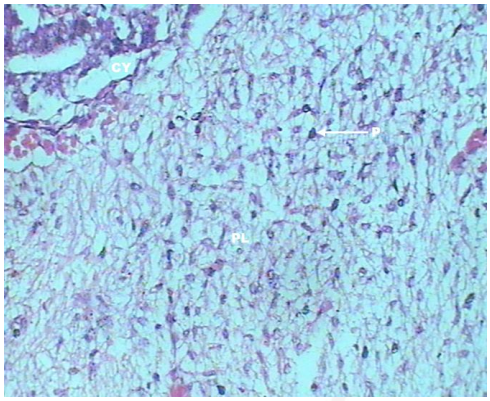


Fig. 6: H&E 40x-24wks- Fully differentiated anterior lobe with well developed portal vessels (PV).

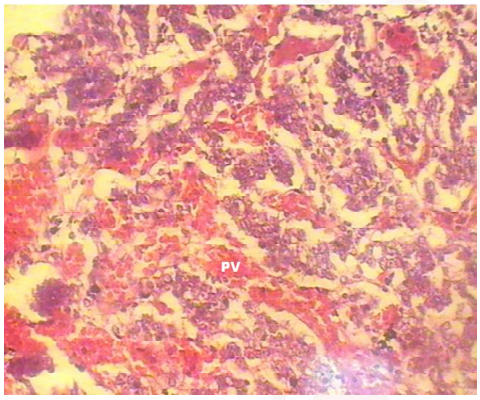


Fig.7: H&E 40x-24wks- colloid filled cysts (CY) in intermediate lobe (IL).

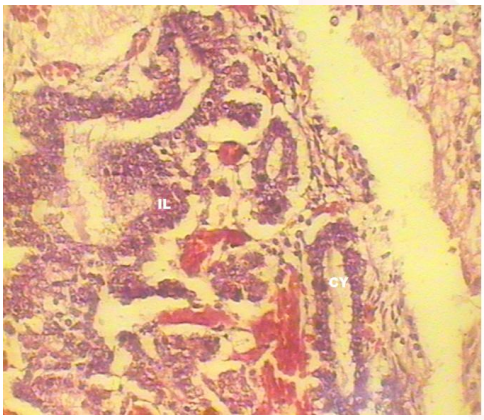


Fig. 8: H&E 40x-36wks- lateral (LR) and middle (MR) regions of anterior lobe.

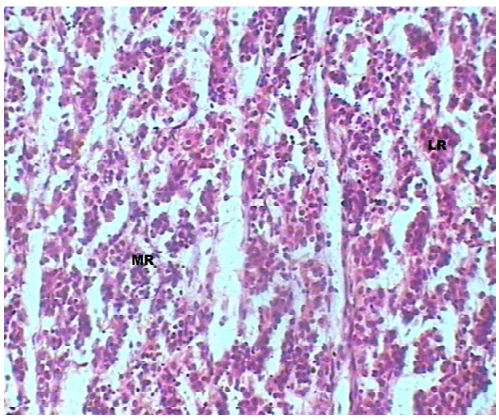
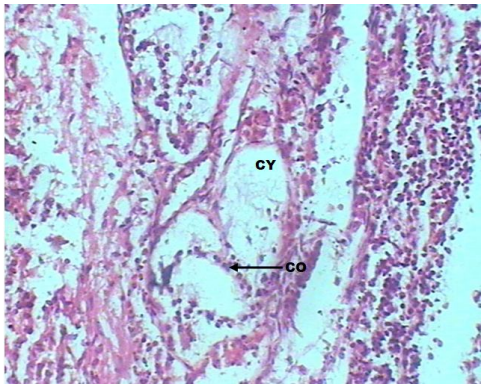


Fig. 9: H&E 40x-36wks- Intermediate lobe showing corticotrophs (CO) lining the cysts (CY).



DISCUSSION

In the present study histogenesis of pituitary gland was observed from 14 weeks of gestational age to full term. On light microscopy, the observations at different gestational ages were discussed as follows:-

Baker and Jaffe [6] in 1975 described that the pituitary gland is recognised grossly by third month of pregnancy when the first hormone producing cells are identified. Corticotrophs are the first cells to differentiate in the human fetal pituitary (at around 5 weeks of gestational age). Somatotrophs appear around 8 to 9 weeks, followed by thyrotrophs and gonadotrophs at 12 to 15 weeks.

In the present study observed at 14 weeks of gestation, the gland is recognised as pituitary in accordance with literature [6]. So connective tissue capsule is observed over the gland. The differentiation of anterior lobe and posterior lobe with intermediate lobe in between is observed. Hypophyseal cleft in between the anterior lobe and intermediate lobe is noted. A gap between the intermediate and posterior lobes is also seen. In the present study, irregular clusters of epithelial cells in the form of nests or cords supported by connective tissue frame work is observed in anterior lobe as described in literature [2]. Incompletely formed portal vessels are seen in anterior lobe. Cysts without colloid are observed in intermediate lobe. Pituicytes are observed but not clearly in posterior lobe.

At 19 weeks the gap between the intermediate and posterior lobes that was observed at 14 weeks disappeared. Eosin stained cells (somatotrophs) predominate in lateral region,

lactotrophs yet to appear in this region. Hematoxylin stained cells (corticotrophs, thyrotrophs and gonadotrophs) predominate in middle region. Cysts without colloid are still seen in intermediate lobe. Pituicytes with nerve fibre tracts are clearly observed in posterior lobe.

Lactotrophs, although seen in small numbers as early as 12 weeks, are recognised fully at 23 weeks [7]. Oxytocin and vasopressin, as well as their carrier proteins, the neurophysins, are detectable in supraoptic and paraventricular nuclei at 19 weeks and in the posterior lobe at 23 weeks.[8] In the present study at 24 weeks, the cells of anterior lobe are fully differentiated with the appearance of lactotrophs. Well developed portal vessels are observed. Colloid filled cysts are observed in intermediate lobe.

CONCLUSION

This study is of immense help in understanding various endocrine abnormalities resulting from hypo or hyper activity of the gland. It is also important for pathologists to diagnose different tumours resulting from abnormal cellular proliferation.

Conflicts of Interests: **None**

REFERENCES

[1]. Ciric I. On the origin and nature of the pituitary gland capsule. J Neurosurg 1977;46:596-600.
[2]. Beatriz S. Lopes et al. Pituitary and sellar region, Title: Histology for pathologists, 3rd Edition.
[3]. McGrath P. Cysts of sellar and pharyngeal hypophyses. Pathology 1971; 3:123 "131.
[4]. Datta. A. K. The interior of cranium: Hypophysis cerebri. In: Essentials of human anatomy-Head and neck. 5th Edition. 2009. P. 213. Current Books International, Kolkata.
[5]. Takei Y, Seyama S, Pearl GS, Tindall GT. Ultrastructural study of the human neurohypophysis. II. Cellular elements of neural parenchyma, the pituicytes. Cell Tissue Res 1980;205:273-287.
[6]. Baker BL, Jaffe RB; The genesis of cell types in the adenohypophysis of the human fetus as observed with immunocytochemistry, Am J Anat 1975;143:137.
[7]. Dubois PM, Begeot M, Dubois MP, Herbert DC. Immunocytological localization of LH, FSH, TSH and their subunits in the pituitary of normal and anencephalic human fetuses. Cell Tissue Res 1978; 191:249-265.
[8]. Asa SL, Kovacs K. Functional morphology of the human fetal pituitary. Pathol Annu 1984;19:275-315.

How to cite this article:
S. Babu Rao, G. Geetha vani, V. Subhadra Devi. HISTOGENESIS OF HUMAN FOETAL PITUITARY AT VARIOUS GESTATIONAL AGES. Int J Anat Res 2017;5(4.1):4469-4473. **DOI:** 10.16965/ijar.2017.376