

Histogenesis of suprarenal gland

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Abstract

Histogenesis of suprarenal gland (right and left) was studied in 30 human fetuses of different gestational age using routine Hematoxyline and Eosine staining in department of Anatomy M.G.M. Medical College and Hospital, Aurangabad. It was observed that suprarenal gland has superficial zone of darkly stained cells beneath the capsule which is permanent cortex. Deeper light zone called fetal cortex. Changes were seen in capsule, cortex and medulla. Thickness of capsule was increased as age advances. The arrangement of permanent cortex changed from discrete cells and clusters to well formed glomerulus as gestational age advances. There was decrease in thickness of fetal cortex with gestational age. As gestational age increases sinusoidal cells and ganglionic cells in medulla increase.

Key Word: Cortex, medulla, sinusoids, histogenesis, suprarenal, chromaffin cells, neuroblastic nodules

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INTRODUCTION

Suprarenal glands or adrenal glands are vital glands essential for life. The word adrenal comes from Latin word 'adrenes' meaning near the kidneys. It has strong influence on function of kidneys. It secretes important hormones that regulate metabolism, immune system function and electrolyte balance. It is important during stress. Removal or destruction of gland leads to death unless the hormones produced by it are supplied artificially. Increase in secretion of corticosteroids causes dramatic reduction in number of lymphocytes. Anatomy of supra renal gland was described almost 450 years ago in 1563 by BartholomeoEustacius and zonation of gland and its distinction from medulla were elucidated shortly thereafter¹. Suprarenal glands are pair of flattened bodies which are golden yellow in colour due to cholesterol contents and situated retroperitoneally on posterior abdominal wall on each side of vertebral column at the

level of 12th thoracic vertebra. It is located on upper pole of kidney². Right gland is tetrahedral in shape and lies at lower level than left suprarenal which is semi lunar in shape. This is due to position of kidney.

MATERIAL AND METHODS

Present study was conducted on 30 human fetuses between 9-40 weeks of gestation. The fetuses were obtained from Department of Obstetrics and Gynecology, M.G.M. Medical College, Aurangabad with prior permission of Head of Department and ethical comity approval. Consent of patient was also taken. Fetuses were either medically terminated or spontaneously aborted or intrauterine deaths. Age of fetus was calculated either by last menstrual period or Crown rump lengths or dating scan. Fetuses were fixed in 10% formalin before dissection. Supra renal glands were obtained by taking longitudinal incision on anterior abdominal wall and gland is processed for histological examination.

Table 1: Fetuses were divided into six groups according to gestational age as follows

GROUPS	Gestational age	Number of fetuses
A	12-16	7
B	17-20	6
C	21-25	6
D	26-30	4
E	31-35	4
F	36-40	3

Exclusion criteria-anomalous foetuses

OBSERVATIONS

Microscopic structure

Group A (12-16 week): At this gestational age we identified capsule of gland .It was thin and made up of collagen fibers. Few fibroblast cells were also seen.

Cortex showed two zones

1. Superficial dark zone which forms $\frac{1}{4}$ of total cortex(permanent or definitive cortex)
2. Deeper light zone which forms $\frac{3}{4}$ of cortex(fetal cortex)

.Junction of permanent and foetal cortex is called transformation zone where we saw polygonal cells with eosinophilic cytoplasm with oval nuclei In permanent cortex cells were in cluster. Neuroblastic nodules were seen. Few chromaffin cells were also seen. Medulla was ill defined with few cells.

Group B (17-20 weeks): At this gestational age, capsule was well identifiable. Superficial zone was differentiated into two zones

1. Deep stained area where cells are arranged in closed packed nests.
2. Deep stained area where cells are arranged in vertical columns.

Deeper part of cortex was undifferentiated and contains sinusoids, Cells are arranged around sinusoids. Under high magnification we saw uniformly arranged small groups of cells in superficial zone. Medulla showed few ganglionic cells, collagen fibers, fibroblast and oval to rounded neuroblastic cells.

Group C (21-25 weeks)

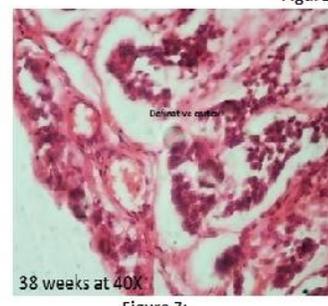
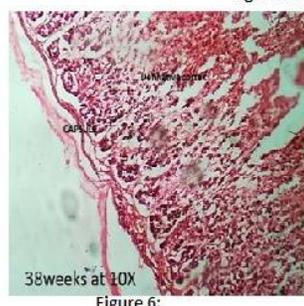
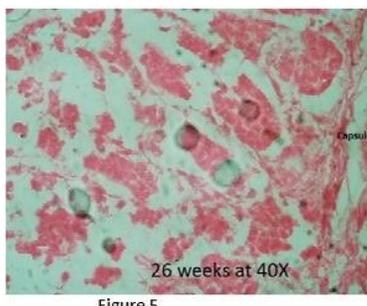
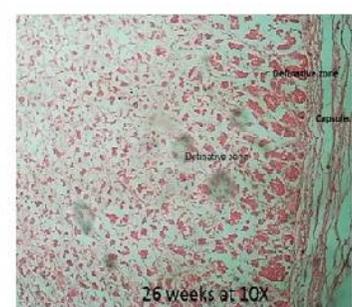
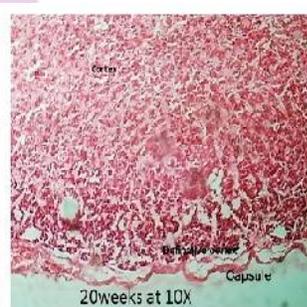
At this gestational age, capsule was well developed. It surrounds the entire gland. Blood vessels were seen in the

capsule at this stage. Trabeculae were also seen extending from capsule. In superficial strip of dark zone (permanent capsule) cells were arranged in small groups and glomerular arrangement of cells were seen distinctly. In deeper lighter zone (fetal cortex) fasciculo-reticular zone was thick. Cells were better defined. Extracellular matrix was also well marked. Perisinusoidal space was increased. Ganglionic cells were also seen.

Group D (26-30 weeks): At this gestational age, capsule was well developed. Permanent cortex was increased. Fetal zone showed degenerative changes. Neuroblastic nodules decreased and chromaffin cells were more. Ganglionic cells were well seen. Medulla was full of blood vessels. Sinusoidal vessels were numerous as compared to previous gestation.

Group E (31-35 weeks): Capsule was thick and well developed. In permanent cortex cells are arranged in arcuate shape which forms future zona glomerulosa. Fetal cortex becomes thin. In medulla more number of chromaffin cells were seen.

Group F (36-40 weeks): Dense capsule and fibroblast with trabeculae were seen extending deep into cortex. Zona glomerulosa was reduced. Transformation zone was disappeared. The cells of glomerulosa were polyhedral, arranged in semicircular groups with central sinusoids. Zona fasciculata showed single cellular line of vertical column. Cells were polyhedral with definite nucleus. Cytoplasm was acidophilic. Zona reticularis was well defined. Small Polyhedral cells were seen between anastomosing cords. Sinusoids are also seen Medulla showed larger cells with many chromaffin cells. There was no boundary between cortex and medulla.



DISCUSSION

Histogenesis of supra renal gland has been subject of interest by number of researchers as it plays vital role in survival and maintenance of internal milieu.¹ It secretes number of hormones essential for life hence any disturbance in its function may cost the life of person. Steroid hormones produced by fetal adrenal cortex regulate intrauterine homeostasis and maturation of fetal organ system necessary for extra uterine life. Therefore appropriate development and function of fetal suprarenal cortex is necessary. Fetal suprarenal gland is also responsible for onset of labour. Hence an attempt was made to study cytoarchitecture of fetal suprarenal gland. The gland parenchyma has two parts, a cortex and a medulla. Both differs structurally, functionally and developmentally. The fetal suprarenal cortex is mesodermal in origin and medulla composed of sympathetic nerve cells which are derived from neural crest. According to Allen *et al*¹ suprarenal gland in armadillo is composed of two definitive regions outer zone I, e. definitive cortex and inner zone i. e. fetal cortex. This is same what we have observed in our study Keene *et al*⁴ observed that degeneration of fetal cortex started during last 10 weeks of intrauterine life and was completed by the end of 1st year. In our study degeneration started between 31-36 week and capsule started appearing at 12th week which was thin initially and gradually thickened as gestational age increased. Capsule was thickened due to condensation of collagen fiber. "In our study, largest part of cortex was contributed by fetal cortex in early weeks of gestation" which was similar to study done by Starkel *et al* and Mc-Intosh⁵. In our study, we recognized medulla by presence of blood

vessels at the centre with few ganglionic cells. Medulla is well demarcated between 26-30 weeks. Chromaffin cells are seen in medulla which were increased in number with advancing gestational age.

CONCLUSION

In our study we observed that, Size of gland increases with increasing gestational age. Capsule of the gland was thin in initial period of gestation but as gestational age increased the capsule became thick due to condensation of collagen fibers. Permanent zone (definitive cortex) of gland becomes bulkier with gestational age where as fetal cortex decreases in size with increase gestational age. Arrangement of cells in permanent cortex changed from discrete cells and cluster to well formed glomerulus with increase gestational period. In medulla ganglionic cells increases with gestation. Chromaffin cells are well differentiated at 12th week. Ganglionic cells are well differentiated 28th week.

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