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Anatomy

HISTOGENESIS OF LIVER IN HUMAN FETUSES

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ABSTRACT The liver is the largest gland of our body, having both exocrine and endocrine function. In the third week of IUI liver arises as ventral outgrowth from the foregut endoderm. Development of liver is an ongoing process that begins after fertilization and continues into postnatal liver. It is an essential organ having extensive power of regeneration. The present study of histogenesis of liver in human fetuses is to unravel the sequence of events in the different weeks of gestation. **Method:** 30 human fetuses ranging between 16–40 weeks of gestation were studied after staining with H&E stains under a light microscope. **Result:** The fetal liver between 16–40 weeks of intrauterine gestation shows hepatocytes and haemopoietic cells. Haemopoietic cells decrease in amount towards term. Hepatic lobule becomes apparent after 20 weeks, and Kuffer cells appear after 26 weeks. We saw the portal triad at 16 weeks onwards till term. **Conclusion:** The present study gave emphasis on detail histogenesis of human fetal liver in the prenatal period ranging from 16–40 weeks of gestation, which is more or less similar with previous studies.

KEYWORDS :

INTRODUCTION:

The liver is the largest gland of our body positioned in right hypochondriac, epigastric and left hypochondriac region below the right dome of diaphragm in the abdomen[1].

The liver consists of both exocrine and endocrine parts. Exocrine part secretes bile and endocrine part secretes various hormones. Histogenesis of liver is the process in which the liver develops from embryonic tissues.

It involves numerous stages like

- Induction
- Specification
- Differentiation
- Morphogenesis
- Maturation
- Postnatal development

In the third week of intrauterine life liver arises as frontal outgrowth from the foregut endoderm. The process is influenced by Fibroblast Growth Factor (FGF) and Bone Morphogenetic Proteins (BMPs). Once induced, the liver precursor cells are called hepatoblasts, which proliferate and form liver bud. This bud invades septum transversum. Hepatoblasts differentiate into two main cell types:

Hepatocyte main functional cell of liver

Cholangiocytes cells lining bile ducts.

The liver bud undergoes branching morphogenesis and forms hepatic lobules and the biliary tree. The liver continues to grow and mature. Blood supply of liver is established with conformation of hepatic artery, portal vein and hepatic vein. After birth, the liver develops and expands and reaches its full size with functional capability. The regenerative capacity of liver also establishes. All these steps are regulated by network of genetic and molecular signals.

MATERIALS AND METHODS:

After taking authorization from institutional Ethic Committee, thirty human fetuses of different gestation (16- 40 weeks) are obtained from department of OBGY MGM MCH Chh Sambhaji Nagarwith prior permission of HOD OBGY. These fetuses are of spontaneous abortions, MTP, FSB (Fresh Still Born) and preterm babies. Gestational age of fetus was calculated by LMP , dating scan or recent USG.

Duration Of Study: 1-year (July24 — June25)

Exclusion Criteria: - Fetuses with conginital malformation.

Fetuses were embalmed and kept in 10 formalin for 24 hours. Liver is dissected by taking midline vertical incision followed by right transverse incision. Paraffin blocks were made. Sections of seven mm thickness were made by using a rotator microtome and stained with hematoxylin and eosin dye. Slides were then observed under compound microscope.

RESULT:

The development of an organ can be studied in different aspects, such as size shape, weight microscopic structure and attainment of function. In our study, we saw microscopic structure and structural changes in central vein, hepatic lobule, sinusoids and portal triad.

We studied microscopic structure of the liver by dividing the fetuses in five groups according to gestational age from group A to group E.

Group A (Gravid age 16–20 weeks)

Liver capsule is seen as a deposit of collagen fibres with some blood vessels. Hepatic parenchyma shows number of incomplete circular or polygonal hepatic lobules with ill-defined portal triad at their corners. Portal triad are covered by a connective tissue. Each hepatic lobule has a central vein with radially arranged rows of hepatocytes. The sinusoids separate the row of hepatocytes. In these sinusoids darkly, nucleated hematopoietic cells were seen. Hepatocytes are more around the central vein.

Group B (Gravid age 21–25 weeks)

Capsule is well-developed with thick connective tissues fibres. The hepatic lobulation is better identified. The hepatic plates show an irregular branching pattern. Sinusoids filled with abundant dark staining cells are seen in between hepatic plates. These dark staining cells are developing blood cells present in different stages of maturation showing hemopoietic function of liver during fetal life.

The cell boundaries are better defined with a lightly stained nucleus in it. The Kupffer cells are seen in the wall of sinusoids. These cells are large with a darkly stained nucleus. The hepatocytes and haemopoietic cells are more or less same in number. The area of hepatic plates is more than the sinusoidal area. The portal triad shows all the three components.

Group C (Gravid age 26–30 weeks)

All the features are well-defined. The haemopoietic activity is much reduced. The glycogen activity is well seen.

Group D (Gravid age31- 35 Weeks)

At this gestational age, clear differentiation of hepatocyte and hepatic lamellae is seen. Haemopoiesis is reduced with absence of primitive blood cells in the hepatic sinusoids. There is further glycogen deposition. We can identify the large hepatic lobule with portal triad at

its corner.

Group E (Gravid age 36–40 weeks)
The capsule is well devepled and thicker due to an increase in layers of connective tissue. Then the liver parenchymal architecture is just like an adult liver. The hepatic lobules are well seen. The boundaries of the hepatic lobule are more prominent. The glandular element is increased than the sinusoidal area. The hepatic cords are one to two cells thick. The three structures of the portal triad are well appreciated. There is an abundant connective tissue in the portal area. The fibroblasts are seen with rounded or globular nuclei. The sinusoidal wall is lined by endothelial cells**.**

Development of liver from 16 to 40 weeks.
Central vein - Appears at 16 weeks and the progressively increases in size.

Portal triad- Appear at 18 weeks

Liver lobule -21-24 weeks

DISCUSSION:
The basic building block of the liver is called a hepatic lobule. Wepfer first described it in 1664, and later, Malphigi confirmed it in 1666. In 1833, Kierman described the hepatic lobule as a hexagonal structure that contains a central vein.

Liver transplantation is used to treat liver failure caused by metabolic diseases and severe cirrhosis.

Liver failure is a serious condition, and liver transplant is the only available treatment. Liver tissue made from stem cells is an unlimited source for transplantation. Alternatively, fetal and neonatal livers are being studied as possible sources for cell-based treatments.[2,3]

The hepatocyte is the most versatile cell in the body. It performs both exocrine and endocrine functions. It produces enzymes that help in breaking down carbohydrates and removing toxins from the body. The liver has a well-organized complex structure that includes:
- Hepatic parenchymal cells
- Presence of blood cell production (haemopoiesis)
- Organized layers of hepatocytes
- Presence of central veins and sinusoids
- Presence of portal triads and hepatic lobules
- Glycogen deposits

In our study, which started at 16 weeks of gestation, we found blood cell production in the fetal liver.

According to Hamilton and Mossman, blood cell production begins early in fetal liver development, peaks around 6-7 months of gestation, and decreases as the baby approaches full term[4.]

In our study, we observed the central vein and portal triad between 16-20 weeks of gestation, which is similar to findings by Desmet VJ and Aradhyula Himabindhu et al[5].

Aradhyula Himabindhu and Marie et al[6] found glycogen deposits at 26 weeks of gestation, while in our study, glycogen deposits were seen between 30-32 weeks.

In this study, the portal triad with its components was found between 16-20 weeks, and the classical liver lobule appeared between 21-24 weeks, which is consistent with the study by Dr. Hashni Inkhab C et al[7].

CONCLUSION:
This study was conducted on 30 human fetuses aged between 16-40 weeks.

The findings of this study align with those of other researchers and the existing literature.

We studied the normal development of the liver at different gestational stages by looking at its microscopic structure, including the appearance of hepatocytes, hepatic plates, central veins, portal triads, and sinusoids.

The production of blood cells in the liver decreases in the later weeks of pregnancy, suggesting that the bone marrow takes over this function. Understanding the development of the liver is important for anatomists, pathologists, pediatricians, and gastroenterologists. Delays in liver development can lead to histopathological and developmental problems.

Using a larger sample size and advanced techniques like electron microscopy along with special staining methods can improve understanding and help in early, accurate diagnosis of liver diseases.

REFERENCES

1. Inderbir Singh's Textbook of Human Histology revised and edited by Neelam Vasudeva and Sabita Mishra. 8th edition pg no 193.
2. Tolosa L, Pareja-Ibars E, Donato MT, Cortés M, López S, Jiménez N, et al. Neonatal livers: a source for the isolation of good-performing hepatocytes for cell transplantation. Cell Transport. 2014;23(10):1229-
3. Khan AA, Shaik MV, Parveen N, Rajendraprasad A, Aleem MA, Habeeb MA, et al. Human fetal liver-derived stem cell transplantation as supportive modality in the management of end-stage decompensated liver cirrhosis. Cell Transplant. 2010;19(4):409-18. 7. Kiernan F. The anatomy and physiology of the liver
4. Hamilton WJ, Mossman HW. Hamilton, boyd and Mossman's human embryology. 4 th ed. London. Mac Millan press ltd. And the William and Wilkins company; 1975:175,339-348.
5. DesnetVJ. Embryology of liver and Intrahepatic Biliary Tract, and Overview of the Malformation of Bile Duct. Ox Textbook of Clinical Hepatology 2nd ed. Newyork: Oxford Medical Publication; 1999: 51-61.
6. Himabindu A, Rao BN. Histogenesis of Liver in Human Foetuses. Int J Basic Applied Med Sci. 2015;5(2):132-9.
7. Hashmi IC. Wankhede HA. Morphology and histogenesis of developing human liver. IJAPB. 2015;2(1):6-11.