International Journal of Anatomy and Research,
Int J Anat Res 2020, Vol 8(1.3):7408-11. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2020.115

Original Research Article

DIFFERENT GESTATIONAL AGE RELATED HISTOGENESIS OF HUMAN FOETAL LIVER

K. Satheesh Naik [1], Sadhu Lokanadham *[2], M Gurushanthaiah [3].

[1] Assistant Professor, Department of Anatomy, Viswabharathi Medical College, Penchikalapadu, Kurnool, Andhrapradesh, India.

*[2] Associate Professor, Department of Anatomy, Santhiram Medical College, Nandyal, Andhrapradesh, India.

[3] Professor, Department of Anatomy, Basaveshwara Medical College, Chitradurga, Karnataka, India.

ABSTRACT

Introduction: Liver is an important gland of gastrointestinal tract having both exocrine and endocrine functions and it is having the extensive power of regeneration. Not only the adult liver, the foetal liver is an important organ with synthetic and haemopoietic functions. It develops as a ventral outgrowth During 3rd week of gestational age from the gut endoderm in the region of the anterior intestinal portal.

Materials and Methods: We used Total of 27 formalin Preserved dead embryos and foetuses from 5weeks to 40 Weeks of gestational age of both the sexes with relevant obstetric records available in the department of Anatomy, Viswabharathi Medical College, Penchikalapadu, Kurnool for this study.

Results: In the present study a total of 27 aborted embryos and foetuses of different gestational ages of both sexes of normal and abnormal were observed (table -1). The liver specimens are categorized in to gestational age groups of 0 – 12 weeks, 12 – 24 weeks, 24 – 36 weeks and more than 36 weeks.

Conclusion: At 5-6weeks of gestational age we observed the aggregation of hepatocytes and early stage of haemopoiesis which is in agreement with literature. Delay in the Histogenesis and development of the liver cells and bile duct system leads to histopathological and developmental abnormalities gives knowledge to the clinicians during clinical procedures.

KEY WORDS: Binucleated Hepatocytes, Kupffer cells, sinusoids

Corresponding Author: Dr.Sadhu Lokanadham, Associate professor, Department of anatomy, Santhiram Medical College, Nandyal, Andhrapradesh - 518501. Contact No: +919542093368
E-Mail: nsatheesh43@gmail.com; drsadhuln.anatomy@gmail.com

Access this Article online	Journal Information
Quick Response code	International Journal of Anatomy and Research RG Journal Impact: 0.21* ISSN (E) 2321-4287 | ISSN (P) 2321-8967 https://www.ijmhr.org/ijar.htm DOI-Prefix: https://dx.doi.org/10.16965/ijar
DOI: 10.16965/ijar.2020.115	Article Information Received: 03 Feb 2020 Accepted: 25 Feb 2020 Peer Review: 03 Feb 2020 Published (O): 05 Mar 2020 Revised: 22 Feb 2020 Published (P): 05 Mar 2020

INTRODUCTION

The liver is the largest gland of the body and consists of both exocrine and endocrine parts. The adult liver has a remarkable regenerative capacity and can completely re-grow when up to 70% of its mass is removed [1]. It develops as a ventral outgrowth During 3rd week of gestational age from the gut endoderm in the region of the anterior intestinal portal [2,3]. Is among the few internal human organs capable of natural regeneration of lost tissue as little as 25% of remaining liver can regenerate [4]. Exocrine part of the liver secretes bile and endocrine part of the liver secretes chemical substances such as glucose from glycogen and most of the plasma proteins. Liver carried out

many functions in the foetus includes glycogen storage, decomposition of red blood cells, plasma protein synthesis, detoxification and haematopoietic. Total hepatectomy with liver transplantation may be the most difficult operation ever derived both technically and physiologically.

The parenchyma of the liver must therefore be arranged so that every hepatocytes on one or more of its surfaces abuts on a passage way that connects with a duct system to carry away its exocrine secretion (bile) and abuts on a blood vessel into which it delivers its endocrine secretions. About 80% of the liver volume and 60% of its cell population is formed by hepatocytes (parenchymal cells). Transport of nutrients across the hepatocytes is the key regulatory step in the fetal growth and development. Recent researches indicate that hepatocytes and cholangiocytes may have been derived from a common precursor or stem cell. [5]

MATERIALS AND METHODS

We utilized a Total of 27 formalin Preserved dead embryos and foetuses from 5weeks to 40 Weeks of gestational age of both the sexes with relevant obstetric records available in the department of Anatomy, Viswabharathi Medical College, Penchikalapadu, Kurnool for this study during 2016 -2019. Foetuses were preserved by injecting 10% formalin solution into the pleural, peritoneal and the cranial cavities. Their extremities were preserved by multiple injecting techniques described by [6]. We collected the liver specimens from abdominal cavity by dissection method. All the specimens were categorized in to four groups based on gestational age. The specimens were preserved in 10% formalin subjected to routine tissue procedure, stained with haematoxylin, periodic acid, reticulin and vengeison stains.

RESULTS AND DISCUSSION

In the present study a total of 27 aborted embryos and foetuses of different gestational ages of both sexes and normal abnormal were observed (table -1). The prenatal specimens are categorized in to gestational age groups of 0 – 12 weeks, 12 – 24 weeks, 24 – 36 weeks and more than 36 weeks. One representative sample of liver tissue from each gestational age group was processed for routine histological examination.

Table 1: Prenatal liver distribution of specimens.

Gestational age (Weeks)	Male(12)	Female (15)	Total
0 -12	1	3	4
12 – 24	2	4	6
24 – 36	2	7	9
>36	4	4	8
			27

Fig. 1: Serial Sections of 6 Weeks showing Porta hepatis (PH), Central Vein (CV) and Sinusoids (SS) of Left Lobe (LL) Under Low Magnification (10x).

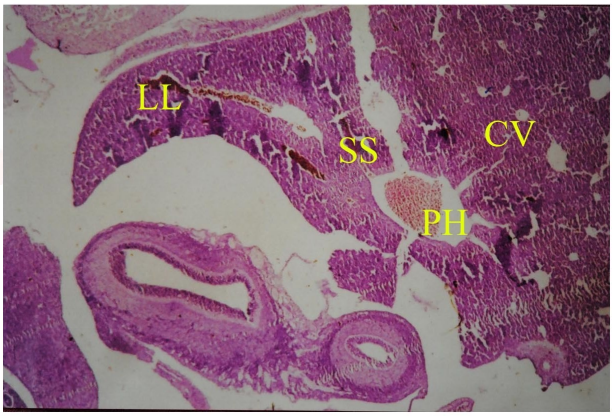
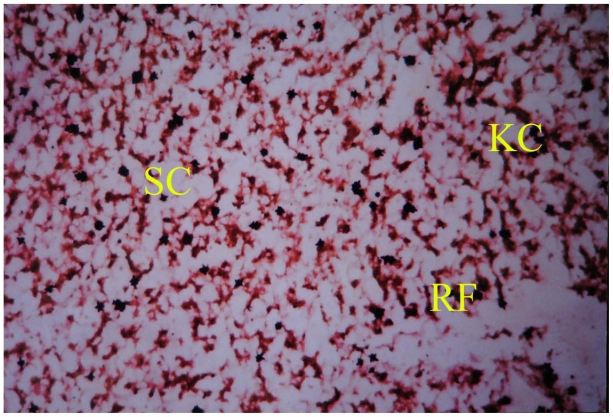


Fig. 2: Microscopic Structure of 20 weeks Male Fetus Showing Reticular Fibres (RF), Kupffer Cells (KS) and Stellate Cells (SS) under Low Magnification (10X).



Development and histogenesis of the liver: we observed early stage of haemopoiesis along with sinusoids and aggregation of hepatocytes in 5 – 6 weeks of gestational age Specimens (Figure - 1). According to Zamboni et al [7] haemopoiesis in liver becomes fully established around 3rd month of intrauterine life. Potter and Craig [8] have observed haemopoietic activity in liver throughout all the fetal ages. Hamilton and Mossman [9] states that, haemopoiesis begins very early in developing liver and reaches its peak at 6th to 7th month of fetal life and

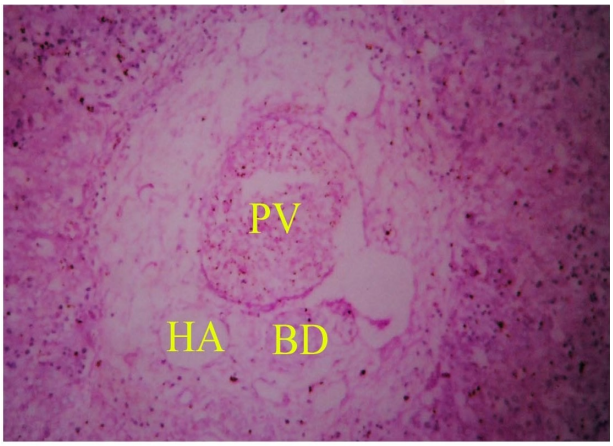
then regresses up to full term. According to Anne et al., (1996) the first stage which extends between 5 to7 weeks of gestation, consists of hepatoblasts arranged in thick, anastomosing cords separated by irregular vascular spaces containing intravascular blood cells, mostly of the erythroid lineage [10].

The findings in the present study in agreement with literature. In 20 weeks of gestational age specimen (Figure – 2). we observed early stage of reticular fibres along with Kupffer cells. According development of Kupffer cells and connective tissue cells begin at about 3rd month of gestational age, we also observed that there was delay in the appearance of Kupffer cells [2].

According to Balis et. Al [11] Kupffer's cells are absent in early stages of gestation. As per the observation by R. N. M. Macsween [12] it has been stated that the sinusoidal endothelial cells i.e. Kupffer's cells and hepatic stellate cells appeared at 10th to 12th week of intrauterine life. The findings in the present study in agreement with literature.

Development of portal triad with central vein and sinusoids surrounded by periportal connective tissue were observed in 24 weeks of gestational age specimen (Figure - 3)

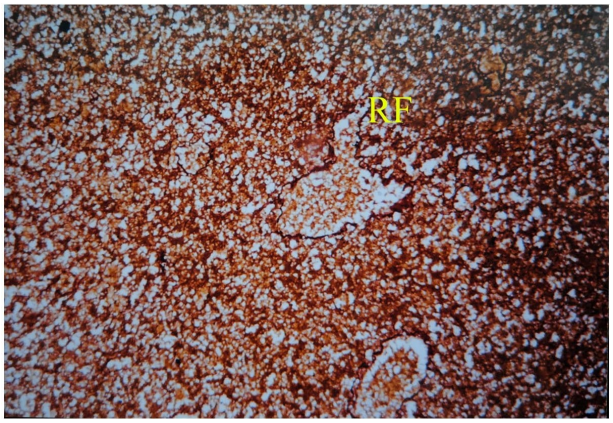
Fig. 3: Microscopic Structure of 24 weeks Female fetus showing portal vein (PV), Bile duct (BD) and Hepatic artery under Low Magnification (10X).



Blouin et all stated that periportal connective tissue surrounding the bile duct system observed during 8-12weeks of gestational age [13, 14].

There was delay in the formation of bile duct system. At 28 weeks of gestational age specimen shows increased reticular fibres with Kupffer cells was observed (Figure - 4)

Fig. 4: Microscopic Structure of 28 weeks Male fetus showing Increased reticular fibres under Low magnification (10X).



According to Zhang Wenxue et all haemopoietic cells were present from 15- 35 weeks of gestational age. Portal triad, bi nucleated hepatocytes, Kupffer cells, portal canal, central vein and sinusoids [15] (Figure - 5)

Fig. 5: Microscopic Structure of 36 weeks Female fetus showing Portal Canal (PC), Central Vein (CV), Kupffer Cells (KC), Portal Vein (PV), Bile Duct (BD) and Hepatic Artery (HA) under Low Magnification (10X).

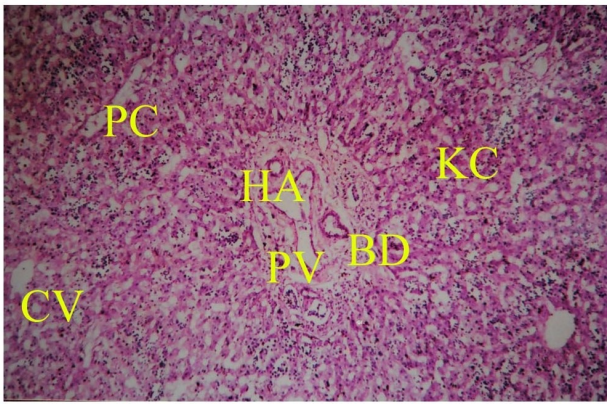
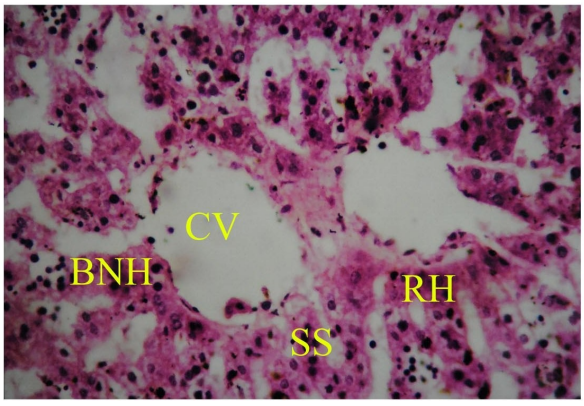


Fig. 6: Microscopic Structure of 36 weeks Female fetus showing Central Vein (CV), Sinusoids (SS), Bi-nucleated Hepatocytes (BNH) and Radiating Cords of Hepatocytes (RH) under High Magnification (40X).



were observed at 36 weeks of gestational age [16,17 &18].The haematopoietic function decreased abruptly in35-week-old foetus [15]. Radiating cords of hepatocytes, Kupffer cells

along with central vein were observed in a specimen at >36 weeks of gestational age (Figure - 6). Haemopoiesis was seen prominently in all the stages studied but gradual decrease in haemopoiesis was found from 24th to 30th weeks of gestation, and after 32nd weeks, scanty foci of haemopoietic tissues were seen [19].

CONCLUSION

In the present study we were stating that there was a delay in the formation of sinusoids and kuffer cells along with the biliary duct systems. At 5-6weeks of gestational age we observed the aggregation of hepatocytes and early stage of haemopoiesis which is in agreement with literature. Delay in the Histogenesis and development of the liver cells and bile duct system leads to histopathological and developmental abnormalities gives knowledge to the clinicians during clinical procedures.

ACKNOWLEDGEMENTS

My sincere thanks to Departmental teaching and non teaching staff for their constant support and efficient guide lines to carry out the research.

Conflicts of Interests: None

REFERENCES

[1]. Michalopoulos GK. Liver regeneration. J Cell Physiol 2007;213:286–300.
[2]. Sadler Langman's medical embryology. 2005;(6): 198-201.
[3]. Robbins and Cotran (1999) Pathologic Basis of Disease.1999;7:101.
[4]. Ajmani. text book principles of embalming techniques in autopsied body.1993: 131-134.
[5]. Ham AW, Cormack DH. Histology: The pancreas, liver and gallbladder. 8th edn. J.B.Lippincott Company. Philadelphia and Toronto 1979;694-724.
[6]. Borghese, E. The present state of research on *WW* mice. Acta Anat. 1959;(36):185-220.
[7]. Zamboni LI. Electron Microscopic Studies of Blood Embryogenesis in Humans II and the haemopoietic activity in fetal liver. J. Ultrastructure, 1965;12(6):525-541.
[8]. Potter EM, Craig JL. Weights Standards for Organs for Early Human Fetuses. Pathology of Fetus and Infants. 3rd ed. Chicago; Year Book Medical 1975.p.15-24.
[9]. Hamilton, Boyd and Mossman. Microscopic Structure of Liver. Human Embryology. 4th ed. London; Macmillan Press Ltd. 1978. P. 339-348.
[10]. Anne Couverald, Jeans-Yves Scoazec, Marie-Christine Dauge, Annie-France Bringuier, Francois Potet and Gerard Feldmann. Structural and Functional Differentiation of sinusoidal endothelial cells during liver organogenesis in humans. Blood Journal, hematologylibray.org 1996;87(11):4568-4580.
[11]. Balis J.U., Chan A. and Conen D.E. Electron Microscopic Study of the Developing Human Liver.Ist ed. Toronto; J.B. Lippincott Company.p.133-147.
[12]. R.N.M. Macsween RNM. Pathology of the Liver.2nd ed. London: Churchill Livingstone press2002.p.1-6.
[13].Blouin A Morphometri of liver sinusoidal cells. Wisse E, Knook KL, eds. Kupffer cells and other liver sinusoidal cells. New York. 1977;(61).
[14]. Suyun histogenesis of human liver Acta Anatomica Sinica, en.cnki.com.cn.1983; 02-16.
[15]. Zhang Wenxue;Bao YuezhaoMorphological Study on the Liver of Human Fetus. Journal of Henan Normal University (Natural Science). 1993;02.
[16]. Bailey's "The text book of Hstology" th Edition, 1958;4:319-336.
[17]. Leeson and Leeson. The text Book of Histology. 1970 (2) pp.319 – 336.
[18]. P.Eroschenko. Di Fiore Atlas of Histology with functional Correlation. 2000;9:219 – 227.
[19]. Moore KL, Persaud TVN. The Developing Human Clinically oriented Embryology. 8th edn. WB Saunders Company, Philadelphia 2008:96,211-242.

How to cite this article:

K. Satheesh Naik, Sadhu Lokanadham, M Gurushanthaiah. DIFFERENT GESTATIONAL AGE RELATED HISTOGENESIS OF HUMAN FOETAL LIVER. Int J Anat Res 2020;8(1.3):7408-7411.
DOI: 10.16965/ijar.2020.115