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Gross and Histomorphological Studies of Liver in Neonatal Rabbit (*Oryctolagus cuniculus*)

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ABSTRACT

Rabbit is a laboratory animal and is used to conduct wide variety of experiments for the welfare of human as well as animals. Liver is the main organ of metabolism and study of xenobiotics is usually carried out in this particular organ. The present study was conducted on six rabbits (non-descript) between 0-3 days of age, procured from laboratory of department of Microbiology, college of Veterinary Science & A.H. Jabalpur. The liver was carefully dissected out and fixed in 10% formalin. After gross measurements tissue samples were processed and 5-6 µm thick paraffin sections were stained with Haematoxylin and Eosin stain and silver impregnation method for histological studies. Mean weight, length, width and height of liver were 16.30±0.37gm, 2.52±0.05 cm, 2.15 ±0.04 cm and 1.07 ±0.03cm respectively. The liver was comprised of two main lobes, right and left, that are separated by a deep median cleft. There were five lobes viz., Left Lateral, Left Medial, Right, Caudate and Quadrate lobes. The extent of the caudate process was bigger than that of the papillary process and the smallest structure in length and height was quadrate lobe. Histologically Mitoses was observed in the liver cells. The cell outline was indistinct and cytoplasm showed extreme variation in appearance as vacuolated, granular, deep staining or pale. There was presence of haematopoietic cells (megakaryocytes) in the stroma of liver.

Keywords: Gross, histology, liver, neonatal, rabbit

Rabbit is a laboratory animal and is used for testing new surgical techniques, for the study of new chemical and pharmaceutical substances and for the production of vaccines and antibodies (Yanni, 2004). Liver is the main organ of metabolism and study of xenobiotics is usually carried out in this particular organ. Liver in an adult rabbit is situated in epigastric region between costal arches, reaching the level of right 7th and left 9th ribs. It is a lobulated organ and comprised of five lobes. Studies on the liver of adult rabbit have been carried out but as far as neonatal is concerned meagre information is available, hence present work was under taken.

MATERIALS AND METHODS

The present study was conducted on six rabbits (non-descript) between 0- 3 days of age, weighing 45 to 65 g, procured from laboratory of department of Microbiology, college of Veterinary Science & A.H. Jabalpur. The liver was carefully dissected out and fixed in 10% formalin. After fixation different gross parameters were recorded by using non stretchable thread, divider and scale. Tissue pieces of 5 mm size were collected and processed by routine histological technique. Paraffin sections were cut at 5-6 µm thickness and stained by Haematoxylin and Eosin method and silver impregnation method (Drury and Wallington, 1980). The data collected were analyzed as per the standard method described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Gross morphology and morphometry

Our study demonstrated that the liver of rabbit was situated in the epigastric region, between both costal arches (right

7th and left 9th ribs). The weight of liver was ranged; 2.5-3.5g with average of 3.00 ±0.19g. That was 5-6% of total body weight. However in adult rabbit it was 3-4% of body weight (Verma *et al.,* 2015).

Insitu the liver touched the left and right abdominal walls (Fig. 1) and its parietal surface was in close contact with diaphragm. The left part of visceral surface of liver covered the lesser curvature of the stomach and right part related with cecum. Similar finding was reported by Verma *et al.* (2015) in adult rabbit.

Distinct lobation was observed with a deep cleft in between the right and left lobes. There were five lobes viz., Left Lateral, Left Medial, Right, Caudate and Quadrate lobes. On parietal view (Fig. 2) quadrate lobe and papillary process was not visible. The left lateral lobe mask the left medial lobe when seen at its visceral view. The morphometric investigation showed that the left lateral hepatic lobe was slightly larger than the right one. Its lateral part was wider and longer than the medial one. The quadrate lobe, (Fig. 3) which is behind the gallbladder was well demarcated with the length and width of 0.88± 0.02 cm and 0.45±0.02 cm respectively. The quadrate lobe is the smallest of all other lobes of liver. Same observation was recorded by Stamatova *et al.* (2012) *and* Verma *et al.* (2015) *in* adult rabbit. The caudate lobe was comprised of caudate process and papillary process, the extent of the caudate process was bigger than that of papillary process. Concerning the gall bladder, it was pyriform in shape and was embedded completely on visceral surface of right

Table 1: Measurements (cm) of different lobes of liver and gall bladder in neonatal rabbit

Parts of the liver	Parameters		Range	Mean ±SE
1. Whole liver	Cranio- caudal length		2.40-2.60	2.52±0.05
	Width		2.00-2.30	2.15 ±0.04
	Height		1.00-1.20	1.07 ±.0.03
	Weight (gm)		2.50-3.50	03.00 ±0.19
2. Caudate lobe				
(a) Caudate process	Maximum Width		1.00-1.10	1.03 ±0.02
	Length		1.60-1.80	1.70 ±0.04
Renal impression	Width		0.50-0.60	0.58±0.02
	Length		1.00-1.10	1.05 ±0.02
(b) Papillary process	Maximum Width		0.60-0.70	0.65 ±0.01
	Length		0.85-0.90	0.88± 0.01
3. Quadrate lobe	Length		0.85-0.90	0.88± **0.02**
	Width		0.40-0.50	0.45±0.02
4. Right lobe	Maximum Width	Cranial	1.30-1.40	1.35±0.02
		Middle	1.70-1.80	1.77 ±0.02
		Caudal	0.60-0.60	0.60±00
	Length		2.40-2.50	2.45±0.02
5. Left lateral lobe	Maximum width	Cranial	1.10-1.30	1.20 ±0.04
		Middle	1.10-1.30	1.22 ±0.03
		Caudal	0.50-0.50	0.50±0.00
	Length		2.40-2.50	2.47 ±0.02
6. Left central lobe	Maximum width	Cranial	1.00-1.20	1.08 ±0.04
		Middle	1.10-1.20	1.17 ±0.02
		Caudal	0.50-0.60	0.55 ±0.02
7. Gall Bladder	Length		2.00-2.10	2.05±0.02
	Width		0.20-0.30	0.27 ±0.02
	Length		0.70-0.80	0.78 ±0.02

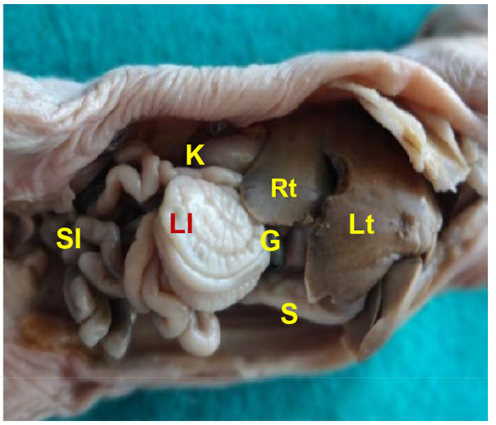

Fig. 1: Insitu position of liver in neonatal rabbit showing Left lobe (Lt), Right lobe (Rt), Gall bladder (Gb), stomach (St), Kidney (K), Small intestine (SI), Large intestine (LI)

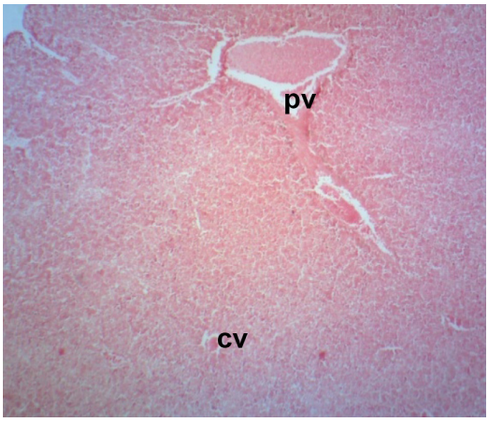

Fig. 4: Photomicrograph of liver in neonatal rabbit. (pv) Branch of portal vein, (cv) central vein, H&E × 100

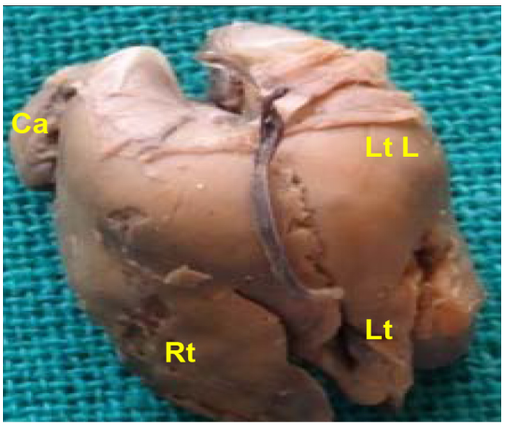

Fig. 2: Parietal view of liver in neonatal rabbit showing Left lateral lobe (LtL), Left medial lobe (LtM), Right lobe (Rt) and Caudate lobe (Ca)

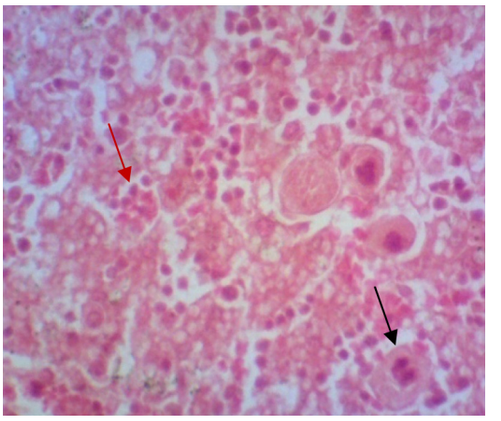

Fig. 5. Photomicrograph of liver in neonatal rabbit showing megakaryocyte (↑) RBCs (↑) H&E × 1000

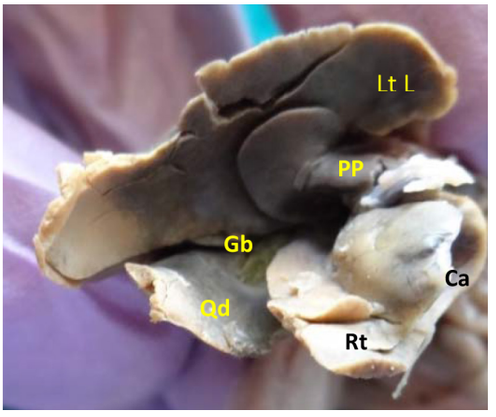

Fig. 3: Visceral view of liver of neonatal rabbit showing Left lateral lobe (LtL), Right lobe (Rt), Quadrate lobe (Qd), Gall bladder (Gb), Papillary process (PP) and Caudate lobe (Ca)

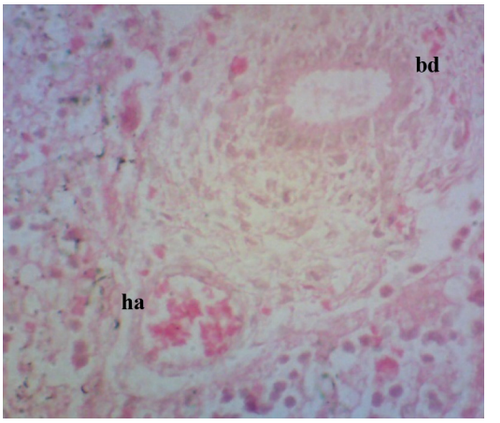

Fig. 6: Photomicrograph of liver in neonatal rabbit showing portal triad; hepatic artery (ha) Bile duct, (bd) H&E × 400

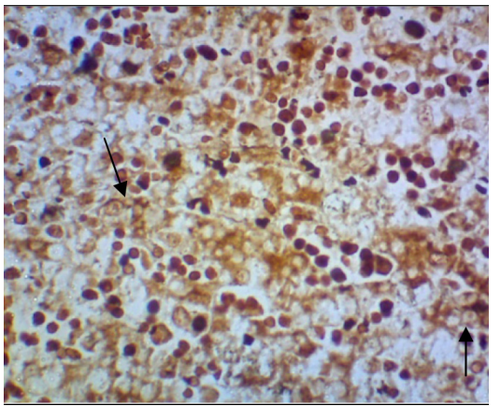

Fig. 7: Photomicrograph of liver in neonatal rabbit showing fine reticular fibres Silver impregnation method × 400.

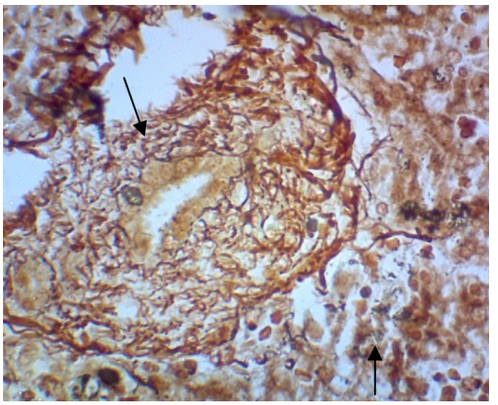

Fig. 8: Photomicrograph of liver in neonatal rabbit showing reticular fibres in the bile duct (interlobular) Silver impregnation method × 400.

lobe. It was comprised of three parts with different sizes, the widest part was fundus and the thinnest structure was its neck.

Histology

The surface of the liver was covered by a thin serosa from which fine strands of reticular connective tissue project inward to form the supporting framework for hepatic cells, blood vessels and bile ducts. Separation into lobules was very indistinct and septae are visible only around interlobular branches of hepatic artery, hepatic portal vein, and bile duct (Fig. 4 & 6). The hepatocytes were large and polygonal shaped with spheroid central one or two nuclei variable in size. Mitoses were observed in the liver cells. Beams and King (1942) noted the same observation in rat. The cell outline was indistinct and cytoplasm showed extreme variation in appearance as vacuolated, granular, deep staining or pale.

Similar finding was reported by Katharine *et al*. (1966) in adult laboratory mouse. The hepatocytes were arranged in cords and separated by sinusoids. There was presence of haematopoietic cells (megakaryocytes) in the stroma of liver (Fig. 5). This finding supports the observation of Katharine *et al*. (1966) in laboratory mouse in which liver has haematopoietic activity during prenatal period and during first few weeks of postnatal life. Vilacajunior and co-workers (2008) also observed the presence of haematopoietic cells in liver of neonatal rats. On silver impregnation staining method the reticular fibres are clearly visible on basement membrane of bile ductule (Fig. 8) and surrounding connective tissue of portal tract. Fine reticular fibres were observed within the liver plates representing bile canaliculi between adjacent hepatocytes (Fig. 7). Trautmann and Fiebiger (2002) studied the channel of bile canaliculi by silver impregnation method in liver of adult rabbit.

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