قسم : التشريح والهستولوجيا .
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بعض الدراسات المورفولوجية على تطور القناة الصفراوية في الجاموس

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يلتقي المسال المرارى بالقناة الكبدية عند زاويه خارج بوابة الكبد لتكون القناة الصفراوية التي تتكون من جزئين . جزء حر وجزء داخل جدار الأثنى عشر ليفتح في حلمه التي يزداد بعدها عن فتحه البواب تدريجيا بزيادة العمر في الحيوان .

جدار القناة الصفراويه في الجزء الحر والجزء بين جدار الأثنى عشر يتكون من الطبقة المخاطية والطبقة الليفيه ومخاط بالطلائي .

الطبقة المخاطية المبطنة لجدار القناة الصفراويه تتكون من طبقة واحده من خلايا عموديه مع خلايا كأسيه كثيره خاصة في الجزء الداخلي لجدار الأثنى عشر .

وتوجد الغدد الأنبوبة الحويصله الصفراويه في الصفيحه الدعاميه المستويه وخاصة في قاع الثنايات المخاطيه .

وتحتوى القناة الصفراويه على خلايا عضليه طوليه ودائريه ولا تحيط بالكامل بالغشاء المخاطي لكن الجزء بين الجدار الأثنى عشر فيحتوى على خلايا عضليه دائريه طوليه ومائله محيطه بالكامل للغشاء المخاطي .

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SOME MORPHOLOGICAL STUDIES ON THE DEVELOPMENT OF THE BILE DUCT IN THE EGYPTION WATER BUFFALO (Bos bubalus)

(With One Table and 4 Figures)

By
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SUMMARY

The anatomical and histological structure of the bile duct in the Egyptian buffalo was studied during the different prenatal and postnatal stages.

The bile duct originates during the early prenatal life as a result of the union of the cystic and the hepatic ducts outside the porta hepatis. It communicates with the primitive duodenum through its intramural part which opens at the duodenal papilla. The bile duct comprises, in the various stages, a free part and an intramural one. The wall of the former is made up of a mucosa followed by discontinuous layer of smooth muscle cells and serous coat. Meanwhile, the wall of the intramural part comprises a mucosa which is completely surrounded with a muscular coat.

INTRODUCTION

The study of the passage cnveying bile from the site of production to the site of utilization is of especial interest. The present work comprises a study on the ontogenesis of the bile duct of the water buffalo in Egypt. The bile duct of cat and dog was described by MCMENN and KUGLAR (1961) and in the dog by BHATNGER (1972). KODAMA (1974) described the bile duct of guinea pig, rabbit and cat. The human bile duct was investigated by KIRK (1944), ABOU EL-NAGA (1965) and by WARWICK and WILLIAMS (1973).

MATERIAL AND METHODS

The material comprises 72 foeti whose crown vertebral rump lenghts (CVRL) ranging between 0.8 - 95 cm., 32 calves (30 - 60 days old) and 29 adult buffaloes (3- 10 years old). The fetal samples were collected from Cairo abbatoir and the postnatal ones from Edfina and Demanhour abbatoirs. Gum milk was injected through the duodenal papilla to demonstrate the biliary system.

The lenght of the bile duct and the distance between the duodenal papilla and the pylorus were measured in the different developmental stages. The samples for histological studies were immediately fixed in 10% formalin for 24 hours, dehydrated by ethanol, cleared by xylene and

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embedded in paraffin wax as usual' 6U thick serial sections were stained with HARRIS Heamtoxylin and Eosin, VAN GIESON elastic stain, reticulin stain after GORDON and SWEETS, PAS, alcian blue and alcian blue-PAS (BANCROFT and STEVENS, 1977).

RESULTS

At the 4 cm CVRL stage, the common hepatic duct and the cystic duct were united at an acute angle outside the hepatic porta to from the bile duct. The latter, consisted of afree part and an intramural one. The free part passed ventrally at right angle to the hepatic artery and caudal to the portal vein, then ran in the lesser omentum to gain the caudal part of the sigmoid flexure of the duodenum to pierce its wall and continued as the intramural part which opend by a slit-like, caudally directed opening on the duodenal papilla. It was observed that the lenght of the bile duct and the distance between it and the pylorus were gradually increased with increasing age as shown in the table.

At the 3 cm CVRL stage, the wall of the free part of the bile duct was formed of a lamina epithelialis, a subepithelial homogeneous mesenchyme (Lamina propria) and a single layer of flattened cells (Serosa). The epithelium was made up of single layer of columnar cells with many mitotic figures and scarce oligomucous goblet cells. The columnar cells had their ovoid deeply basophilic nuclei at the luminal poles while their infranuclear regions had basophilic and PAS positive cytoplasm. The goblet cells had PAS and alcian blue positive material but the latter predominates. With the increase of the intrauterine age, the nuclei of the columnar cells became basally located and ther was gradual decrease in their content of the PAS positive material. At the same time, goblet cells were steadily increased in number. Sporadic smooth muscle cells could be detected mid-way between the epithelium and the serosa. The intramural part had a similar epithelium but the goblet cells were larger in number (Fig. 1), a subepithelial mesenchyme and a continuous muscular coat consisting of inner longitudinal, middle oblique and outer circular layers which could not be demarcated from the muscular coat of the duodenum (Fig. 2 & 3). Reticular fibers and scanty fine collagenic fibers were present among the subepithelial mesenchyme at the 4 cm CVRL stage. Collagenic fibers were greatly increased in amount on the expense of the reticular fibers. Elastic fibers were firstly observed at the 20 cm CVRL stage. It was observed that the epithelium and the underlying mesenchyme were evaginated, at certain areas, onto the lumen forming some mucosal folds. The latter were increased in number and size with the increase of age especially in the intramural part. In the postnatal stages, the folds become branched and give off secondary and tertiary ones.

At the 12 cm CVRL stage, scattered lymphocytes were observed among the subepithelial mesenchyme and some of them were insinuated inbetween the epithelial columnar cells. In the postnatal subjects, these lymphocytes were in the form of lymph nodules found in the lamina propria.

At the 14 cm CVRL stage, epithelial downgrowths into the underlying mesenchyme were firstly detected. The downgrowths were cord-like and made up of undifferentiated cells. With the increase of age, the bottoms of the downgrowths became branched and dilated in the form of alveoli lined with simple cuboidal epithelium. The latter cells react positively to both PAS and alcian blue. The piece connecting the luminal epithelium with the alveolus became tubular in shape. The whole structure gives the appearance of branched tubuloalveolar glands. The latter glands were very much increased in number during the postnatal stages (Fig. 4).

DISCUSSION

Regarding the formation of the bile duct, the present results are in agreement with ROTHMAN(1966) in man, EL-HAGRI (1967) and GITTY (1975) in domestic animals. SINGER and SINGH (1971) reported slso that the bile duct in the Indian buffalo is formed by the union of the cystis and hepatic duct. The present study has revealed the presence of a single bile duct. HIGGINS (1926) stated that there are more than one bile duct in dog.

The distance between the pylorus and the duodenal papilla was gradually increased by increasing age. These results are in accordance with those of EL-HAGRI (1967), HABEL (1975), NICKEL et al. (1973) and FRANDSON (1975) in the adult domestic animals.

The wall of the free part of the bile duct was made up of inner mucosa and outer serosa squeezing inbetween a discontinuous layer of smooth muscle cells. This structure is similar to that described in dog (BHATNAGER, 1972). It was observed that the reticular fibers were the first fiberous elements appeared among the subepithelial mesenchyme during the early fetal stages. With advancing age. the collagenic fibers predominate on the expense of the reticular ones. From the early beginning, the luminal epithelium of the bile duct was simple columnar with few goblet cells. The latter increased considerably towards the full-term and in the early postnatal stages especially in the intramural part. MCMENN and KUGLAR (1961) reported that the goblet cells are missing in the bile ducts of dog and cat.

The primordia of the subepithelial glands were firstly observed at the 14 cm CVRL stage as downgrowths from the luminal epithelium. Soon they were differentiated into a branched tubulo-alveolar form producing both neutral and acid mucins. Similar glands were described in the human bile duct (KIRK, 1944).

The intramural part was consisting of inner mucosa similar to that of the free part followed by spirally oriented muscular layer (longitudinal, oblique and circular) which was not demarcated from the muscular coat of the duodenum. It can be suggested that this muscular layer was drived from the duodenal muscular coat. These results are similar to those described by KIRK (1944), ABOU EL-NAGA (1965) and WARWICK & WILLIAMS (1973) in man and by KODAMA (1974) in cat, rabbit and guinea pig.

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LEGENDS

Fig. (1): Cross section of the intramural part of the bile duct of the buffalo fetus (CVRL 86 cm). H & E stain X 200
1) Lumen of the bile duct. 2) Goblet cells.
3) Lamina propria. 4) Longitudinal muscle cells.
5) Circular muscle cells.

Fig. (2): Cross section of the duodenal papilla of buffalo fetus (CVRL 45 cm). H & E stain X 100
1) Duodenal lumen. 2) Mucosal fold.
3) Lamina propria of the duodenal wall. 4) Circular muscle cells.
5) Longitudinal muscle cells. 6) Lamina propria of the bile duct.
7) Lamina epithelialis of the bile duct.

Fig. (3): Cross section in the intramural part of the bile duct of the buffalo fetus. (CVRL 26 cm). H & E stain X 63
1) Lumen of the duodenal papilla. 2) Lamina epithelialis of the bile duct.
3) Lamina propria. 4) Tunia musclaris. 5) Duodenal lumen.

Fig. (4): Cross section in the bile duct of buffalo calf. Alcian blue-PAS stain. X 200
1) Lamina epithelialis. 2) Goblet cells.
3) Tubulo-alveolar glands. 4) Lamina propria.

Table (1)

(CVRL, days or years)	Lengh of the bile duct/cm	Distance between pylorus and duodenal papilla/ cm
4-15 cm CVRL	0.2 - 0.4	0.3 - 1.0
17-29 cm CVRL	0.6 - 1.3	1.8 - 4.0
30-56 cm CVRL	1.35- 2.0	4.1 - 9.0
60-95 cm CVRL	2.1-- 3.0	10 -27
Calves (30 - 60 days)	3.5	30
Adult (3 - 10 years)	5 - 6.5	40 -55

Fig. (1)

Fig. (2)

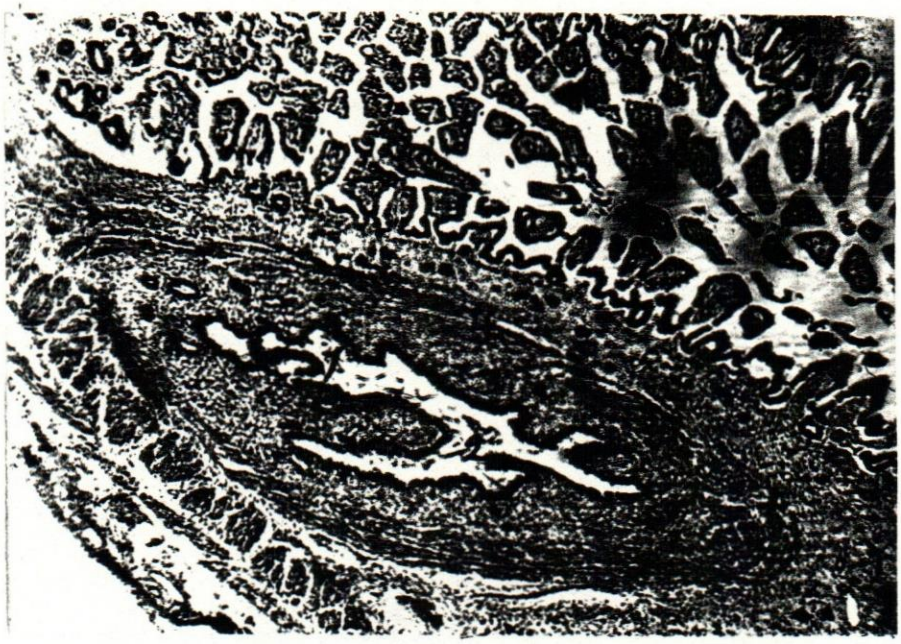

Fig. (3)

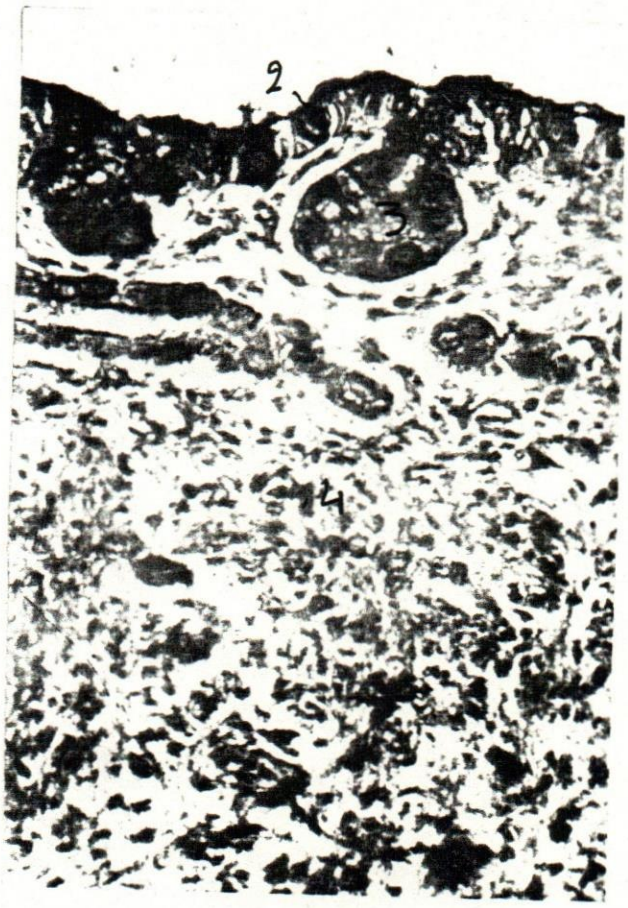

Fig. (4)