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دراسة تشريحية على الحويصلة المرارية للجاموس المصري في مراحل نموها المختلفة

عبد الله حفني ، أنور قاسم ، عبد السلام حموده ، رأفت البقري

تمت الدراسة بفحص ٤٤ جنين و ٥٥ كبد من حيوانات بعد
الولادة والجاموس البالغ وقد وجد أن الشكل الكمثري
للحويصلة المرارية وكذلك موقعها في حفرة الحويصلة المرارية
لا يتغير أثناء مراحل النمو المختلفة ولكن هناك بعض
التغيرات في علاقتها بالأعضاء المجاورة أثناء هذه المراحل .

وقد وجد أن تثبيت الحويصلة المرارية الى السطح الحشوي
للكبد في جميع المراحل يتم عن طريق النسيج الضام وكذلك
بالغشاء البريتوني وشريط من النسيج الضام يمتد من الاثنى
عشر والمسال المراري ليصل الى الحويصلة المرارية وأيضا
يساعد المسال المراري في التثبيت .

أما بالنسبة لطول وعرض الحويصلة المرارية فقد وجد أنها
تزداد تدريجيا مع عمر الحيوان وكذلك سعتها تزداد مع
زيادة حجم وعمر الحيوان .

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**ANATOMICAL STUDIES ON THE GALL BLADDER OF THE EGYPTIAN
WATER BUFFALO DURING ITS DIFFERENT DEVELOPMENTAL STAGES**
(With 4 Figures)

BY

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SUMMARY

The gall bladder was examined during prenatal and postnatal stages. Its shape, and position in the fossa vesicae felleae were unchanged during the developmental stages, but the relation was changed. The gall bladder was fixed in position by the attachment to the visceral surface of the liver by connective tissue as well as a band extends from duodenum to cystic duct and reached the body.

The length width and capacity of the gall bladder increased with the age of the animal.

INTRODUCTION

An exact knowledge of the structure and function of the digestive system in the buffalo is in need for the veterinarians but in the available literature we could not find datas on the structure of the gall bladder in the Egyptian water buffalo. For this reason the gall bladder received our attention was studied embryologically and gross anatomically.

MATERIAL and METHODS

Studies were made on the gall bladder of 44 fetuses from both sexes and different ages. Moreover 55 liver with attached gall bladder of buffaloes ranging from 30 days to 10 years of age were collected.

The buffalo fetuses were collected at random as the successive ages were not available. They were arranged in groups :-

- Group I 4 - 10 cm CVRL
- Group II 12 - 20 cm CVRL
- Group III 24-42 cm CVRL
- Group IV 20 - 60 cm CVRL
- Group V 70 - 95 cm CVRL.

RESULTS

Prenatal developmental stages

Group I: 4 - 10 cm CVRL:-

The gall bladder was vesicular in shape, somewhat hard in consistency and about 4 cm in length and 3 cm width. It was embedded in the visceral surface of the liver between

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the quadrate and right lobes except for the medial surface which was related to the small intestine. It reached the ventral border of the liver and could be seen from the parietal surface through the fissure between the two lobes.

Group II: 12 - 20 cm CVRL:-

The gall bladder became pearshaped and reached about 1.2 cm length and 0.8 cm width. Its fundus stopped shortly before the ventral border of the liver and its body was related to the small intestine and laterally to the liver. The neck and cystic duct were related to the descending and caudal flexure of the duodenum. In addition to the cystic duct and blood vessels and nerves, the gall bladder was fixed by connective tissue to the liver and by fibrous band to the descending duodenum.

Group III: 24 - 42 cm CVRL:-

Early in this group the gall bladder reached the ventral border of the liver and measured 1.3 - 2 cm length and 1 - 1.9 cm width (fundic part). Laterally the gall bladder was related to the liver and the lateral abdominal wall, and medially to the duodenum and right lobe of the pancreas. Its free surface was covered by peritoneum which was reflected on the liver. A connective tissue band coursed between the descending duodenum and cystic duct and terminated on the neck of the gall bladder.

In 36 cm CVRL the gall bladder was sac-like in shape with S-shaped neck. It extended about 1 cm beyond the ventral border of the liver and its lateral spect reached the abdominal wall, about 1 cm behind the last rib and 2 - 3 cm ventral to the right kidney.

In 24 cm CVRL the gall bladder became an elongated pear-shaped sac and related to the liver and to a certain extend to the lateral abdominal wall. Its fundus was related medially to the cecum, and about 3.8 cm far from the caudal border of the last rib.

Group IV: 50 - 60 cm CVRL and **Group V:** 70 - 95 cm CVRL:

During the first group, the gall bladder extended a variable distance from the ventral border of the liver (Fig. 2) while during the second developmental stage the gall bladder protruded from the ventral border of the liver for about 2 - 3 cm. It close to the right of the median plane, about 3.5 cm behind the caudal border of the vertebral end of the last rib.

The length and width of the gall bladder increased gradually and reach in the last stage 5 - 5.5 cm in length and 2 - 3.5 cm in width. It became medially related to the greater omentum and small intestine.

Postnatal developmental stages

The gall bladder of the newly born calves appeared as a small sac situated between the quadrate and right lobes of the liver. It was lodged in an elongated and somewhat deep fossa which extended dorsally to be occupied by the cystic duct.

The fundic region projected about 0.5 - 1 cm beyond the ventral border of the liver. Laterally, the bladder was related to the liver and to the last intercostal space, while medially to the omasum and cranial part of the duodenum. Fixation of the gall bladder was carried out by the peritoneal covering which included the whole fundic and free part of the body, neck and cystic duct. It was fixed to the liver by the connective tissue and a band of the same tissue linked the gall bladder to the descending part of the duodenum. In addition the cystic duct, blood vessel and nerves took a part in fixation.

In new-born calves the length of the gall bladder reached about 5 - 7 cm and the width about 3.5 cm while in the adult buffaloes the length varied from 6 - 13 cm and the width about 5 - 10 cm. The body and fundus became rounded when the gall bladder was filled, and the fundus projected 2 - 3 cm from the ventral border of the liver. In 8 - 10 years old buffaloes a pouch could be observed between the neck and body from the right side (Fig. 3). The fossa vesicae felleae was deep and narrow and occupied the neck and cystic duct, while ventrally it was wide and shallow and lodged the body of the gall bladder. The hepatocystic ducts, one or two in number, connected the liver directly with the neck of the gall bladder.

The size of the gall bladder is correlated with the age of the animal. the capacity in young calf was about 30 ml while in adult buffaloes miht reach about 620 ml.

The cystic artery was the main blood supply to the gall bladder (Fig. 4). It originated from the proper hepatic artery and continued on the medial side of the cystic duct and the neck of the gall bladder where it divided into small medial and large lateral branches. The lateral branch passed under the lateral side of the gall bladder, continued on the ventral aspect of the fundus where it extended dorsally and cranially, and finally joined itself near its origin. The medial branch gave several twigs which supplied the medial aspect of the gall bladder.

The nerve fibers from the celiacomesentric ganglia reached the porta hepatis and gave branches to the liver. A large nerve on the cystic duct continued with cystic artery to the gall bladder. The vagus nerves sent small branches to the biliary tract via the ventral esophageal trunk.

DISCUSSION

In the present study, the gall bladder as in other domestic animal (EL-HAGRI 1967 and NICKEL et al. 1973) had a pear-shaped outline in the prenatal and postnatal stages. FRANDSON (1975) mentioned that it was tubular and bent.

The dimensions of the gall bladder increased gradually with the age, and reached in the adult buffalo about 13 cm in length and 10 cm in diameter. Similar observations were given by SISSON and GROSSMAN (1975), HABEL (1975), FRANDSON (1975) and NICKEL et al. (1973). MILLER et al. (1964) reported that in the smaller dogs the gall bladder reached about 5 cm in length and 1.5 in diameter. The small pouch or infundibulum presented between the body and neck on the right side of the gall bladder was also described by DAVIES and HARDING (1942), RITHMAN (1966) and PANSKY in man.

The location of the gall bladder given by MILLER et al. (1964) and EL-HAGAR (1967) in dog, NICKEL et al. (1973) SISSON and GROSSMAN (1975) and POPESKO (1977) in domestic animals is inagreement with that of the boffalo. It was occupied in fossa between the qladrate and right lobes of the liver in the prenatal and postnatal stages. On the other hand FRANDSON (1975) mentioned that in cat it is situated in a depression on the right medial lobe only.

The present study revealed that the fundus of the gall bladder may reqch the ventral border of the liver in the prenatal stages and projected beyond the ventral border in the late prenatal and postnatal stages. These results do not agree with those given by EL-HAGRI (1967) NICKEL et al. (1973), ELLPORT (1975), PENSAON and POPESKO (1977) who stated that the fundus did not reach the ventral border of the liver in postnatal stages in dog and pig, but gave similar observations in the ox. ROTHMAN (1966) in man reported the extension of the fundus only in the postnatal stages.

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Regarding the fixation, the present studies agree with EL-HAGRI (1967) and SISSON and GROSSMAN (1975) in ox, that the proximal part of the gall bladder was fixed in position by fibrous connective tissue, while peritoneum from the liver formed a continuous covering for its surface including sides and the ventral aspect of the fundic portion. Moreover a connective tissue band extended from the duodenum via the cystic duct and neck to the body of the gall bladder. This was in a line with ROTHMAN (1966) and WIARWICK and WILLIAM (1973) in man.

The origin and course of the cystic artery in the buffalo resembled that of the ox (GHOSHAL 1975). In the buffalo, more than one cystic artery was demonstrated which was also observed in the dog by MILLER *et al.* (1946) and in man by ROTHMAN (1966) & WIARWICK and WILLIAM (1973).

The innervation of the gall bladder from the celiacomesentric plexus and the ventral vagus branch was similar to that of the dog (ALEXANDER, 1940; CHIU, 1943 and MILLER *et al.* 1964) and man (WIARWICK and WILLIAM, 1973 and BROOK 1974).

REFERENCES

- Alexander, W.F. (1940): The innervation of the biliary system J' Comp. Neurol' 72. 357 - 370.
- Bloom, W. and Fawcett, D.W., (1971): A text book of histology saunders Co. Philadelphia. London. Toronto lagace Tokyo.
- Bradbury, S. (1977): Digestive system in hewer's text book of Histology for medical students 9th ed Revised. The English language book Society and William Heineman medical books LTD London.
- Brook, P. (1974): Anatomy and Physiology of the gall bladder and bile duct. In Gastroentology. Section VIII 611 - 614.
- Chiu, S.L. (1943): The superficial hepatic branches of the vagi and their distribution to the extrahepatic bililar tract in certain mammals. Anat. Res. 86 : 149 - 155.
- Davies, F. and Harding, H.E. (1942): Pouch of Hartmann, Lancet 1 : 143 - 5.
- El-Hagri, M.A.A.(1967): Splanchnology of Domestic animals 1st Ed. Cairo Univ. Pres.
- Ellenport, C.R. (1975): Canine, digestive system in GETTY R. SISSON and GROSSAN S. The anatomy of the domestic animals 5th edit. Saunders Co. Philadelphia, London Toronto.
- Frandsen, R.r., (1975): Anatomy and Physiology of the farm animals 2nd edit. Lea and Febiger Philadelphia.
- Ghoshal, N.G. (1975): Heart and Arteries in ox in GETTY, SISSON and GROSSMAN'S. The anatomy of the domestic animals 5th edit. Saunders Co. Philadelphia, London, Toronto.
- Habel, R.E. (1975): Ruminants digestive system in GETTY, SISSON and GROSSMA'S. The anatomy of the domestic animals 5th edit. saunders Co. Philadelphia London; Toronto.
- Hatami, N. Monazah and O. Abdallah (1978): Study on the morphology of the gall bladder of the goat. Acta Anat. 100 : 203 - 209.
- Miller, ME. Christensen G.C. and Evans H.E. (1964): Anatomy of the dog. W.B. Saunder, Company, Philadelphia London.
- Nickl. R. Schummer, A. and Seiferie, E.(1973): The viscera of the domestic mamals 1st Englished, Parey Belin, Hambrug.
- Pansky, B. (1975): Dynamic Anatomy and Physiology, Mac millan Publishing Co. Inc. New York. Collier Mac millan Publishers London.
- Popesko, P. (1977): Atls of topographical Anatomy of the demestic animals Vol. 1 2nd edit. W.B. Saunders company Philadelphia; London. Toronto.
- Rothman, M.M. (1966): Anatomy and Phisology of the gall bladder and bile duct.

Sisson and Grossman (1975): The anatomy of the domestic animals. 5th edit' Saunders Co. Philadelphia, London, Toronto.

Stinson and Calhoun, M.L. (1976): In DELIMAN and BROWN TEXT book of Vet. Hist. (Lea and Febiger, Philadelphia).

Wiarwick and William (1973): The digestive system GRAY'S Anatomy 35th edit. London.

LEGINDS

Fig. (1): Visceral surface of the liver in Buffalo fetus CVRL 42 cm.

- 1- Fundus of the gall bladder. 2- body of the gall bladder.
 3- merk of the gall bladder. 4- cystic duct.
 5- hepatic duct. 6- bile duct. 7- duodenum
 8- Right lobe. 9- quadrate lobe. 10- left lobe.
 11- ventral border. 12- doral border.

Fig. (2): Visceral surface of the liver of buffalo fetus CVRL. 56 cm.

- 1- Fundus of the gall bladder. 2- body of the gall bladder.
 3- neck of the gall bladder. 4- cystic duct. 5- hepatic duct.
 6- bile duct. 7- duodenum. 8- quadrate lobe. 9- Right lobe.
 10- left lobe. 11- ventral border. 12- caudel vena cava.

Fig. (3): Visceral surface of the liver of and adult buffalo (10 years of age).

- 1- body of the gall bladder. 2- neck of the gall bladder. 3- pouch.
 cystic duct. 5- common hepatic duct. 6- bile duct.
 7- duodenum. 8- ventral border. 9- quadrate lobe.
 10- Right lobe. 11- left lobe. 12- papillary proccss.

Fig. (4): Blood supply of the gall bladder of adult buffalo (8 years of age).

- 1- hepatic artery. 2- cystic artery. 3- lateral branch. 4- Medial branch.
 5- Line of peritoneal reflection.

A- Fundus of the gall bladder. B- body of thegall bladder.

C- Neck of the gall bladder. D- cystic duct.

E- Bile duct. F- hepatic duct.

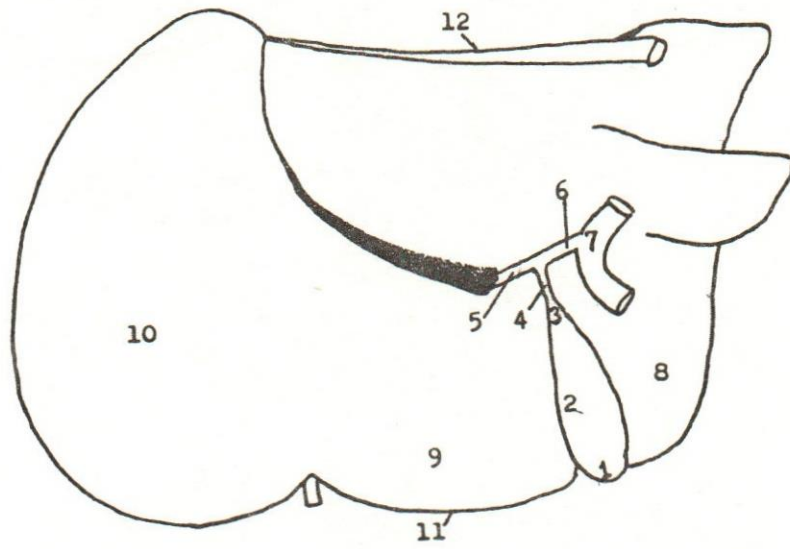


Fig. (1)

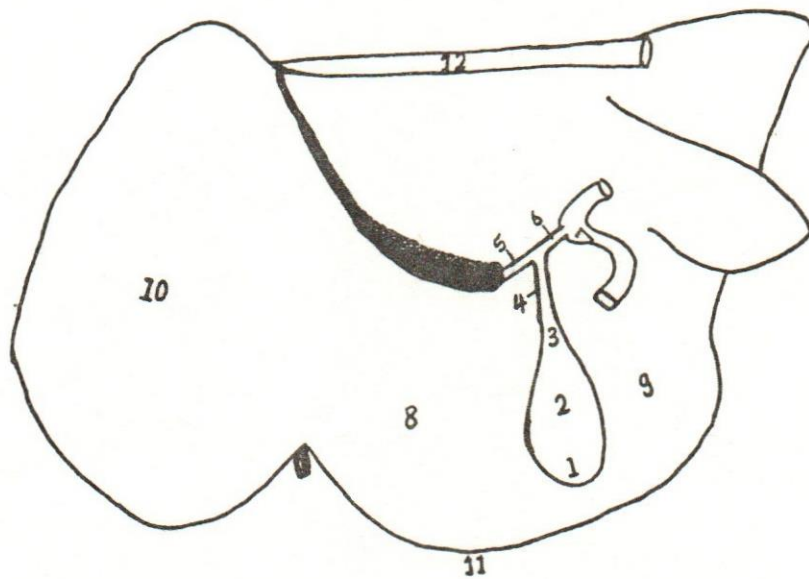


Fig. (2)

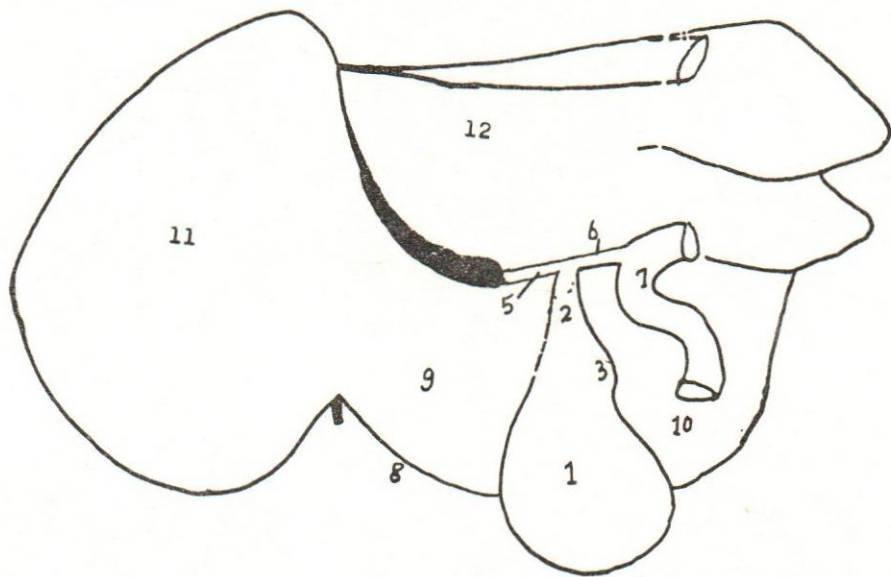
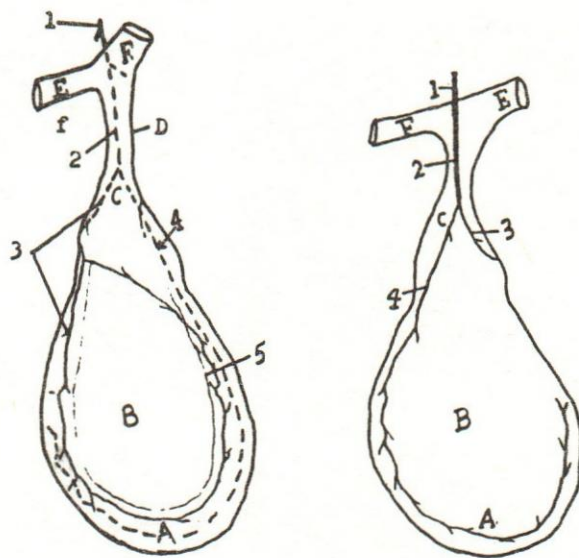


Fig. (3)



Attached surface of the
gall bladder

Free surface of the
gall bladder

Fig. (4)

