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Gross anatomical study on the tributaries of the hepatic portal vein in cattle egret (Bubulcus ibis)

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Abstract

The aim of the current work study to increase the anatomical knowledge about the cattle egret which considered economically important for farmers. The study was carried out on ten adult, apparently healthy cattle egrets of both sexes. Each bird was exsanguinated; the caudal vena cava was cannulated and flushed with warm normal saline solution (0.9%) then injected with blue colored neoprine (60%) latex in order to study the tributaries of the hepatic portal vein. The origin, course and tributaries of the right and left hepatic portal veins were studied. The hepatic portal venous system collected venous blood from the abdominal viscera including; glandular and muscular stomachs, liver, pancreas, spleen, small intestine and large intestine. The hepatic portal vein was formed by the left and the right hepatic portal veins. The smaller left one drained blood from the glandular and muscular stomachs through the ventral and the left proventriculus as well as the left gastric veins. The most tributaries of the right hepatic portal vein drained blood from the rest of the gastrointestinal tract and the spleen by the proventriculosplenic, the gastropancreaticoduodenal and the common mesenteric veins.

Key words: Cattle egret - Hepatic portal vein.

Introduction

Cattle egret originates in Africa and belongs to family Ardeidae, which founds in warm temperate zone and distributes to all over the world, as in India, China, Japan and Australia. Their favored foods include insects, frogs, fishes, crayfish, small snakes and even nestling birds and bird eggs. It considered an agriculturally important bird, and responsible for removal of almost 88.7% of destructive pests from resource poor farmers land (Sharah et al., 2008).

The importance of cattle egret to the farmer has initiated and boosts the interest to establish more accurate and specific anatomical facts about the venous drainage of their gastrointestinal tract as well as an attempt to our knowledge on cattle egret which has received little attention in field of veterinary anatomy.

Material and Methods

The present study was conducted on ten adult, apparently healthy cattle egrets of different sexes which obtained from the farms in Giza and Kaliobia governorates. Before their exsanguinations, they were anaesthetized by IM injection of 0.5 cc of 2% xylazine HCL (3 mg/kg) in order to provide relaxation of muscle and prevent vasoconstriction, followed by the injection of heparin (Cal Heparin, 5000 I.U.) in the wing vein to prevent fast blood clotting.

Each specimen was exsanguinated through the common carotid arteries and then left to bleed for 5-10 minutes, the breast muscle and sternum were carefully removed to expose the heart. The caudal vena cava was cannulated and flushed with normal saline solution (0.9%), and then the caudal vena cava was injected with 60% Neoprine latex colored blue with Rotring® ink.

The specimens were left in a mixture of 10% formalin, 2% phenol and 1% glycerin for three days before dissection. The obtained results were photographed using Sony® digital camera 12.1 mp, 4x. The nomenclature used was that recommended by the *Nomina Anatomica Avium* (Baumel et al., 1993).

Results

V. hepatica porta:

The portal vein (figs.1, 2 and 3 /1); was formed by the confluence of the left and the right hepatic portal veins, and located at middle portion of the porta hepatis of the liver between its right and left lobes, ventral to the ventral border of the gall bladder, and dorsal to the pyloric part of the stomach.

V. hepatica porta sinistra:

The left hepatic portal vein (figs.1, 2 and 3 /2); was a small vessel, measured about 2.5 cm. It was formed at the left ventral surface of the proventriculus by the union of three tributaries; the ventral proventricular, the left proventricular and the left gastric veins then continued cranioventrally to join the stem of the hepatic portal vein.

V. proventricularis ventralis:

The ventral proventricular vein (fig.1 /4); was about 2 cm. thin vessel formed by 2-3 fine twigs along the ventral border of the proventriculus. It drained the restricted part of the proventriculus then continued cranioventrally to join the left hepatic portal vein.

V. proventricularis sinistra:

The left proventricular vein (fig.1 /5); was the second tributary to the left hepatic portal vein. It was thin 1 cm. vessel formed by 2-3 fine twigs drained the left surface of the proventriculus then continued cranioventrally to join the left hepatic portal vein.

V. gastrica sinistra:

The left gastric vein (figs.1 and 2 /6); was about 3 cm. thick vessel formed by 3-5 fine twigs drained from the central tendentious part of the muscular stomach, then extended cranioventrally on the left lateral aspect of the ventriculus to join the left hepatic portal vein.

V. hepatica porta dextra:

The right hepatic portal vein (figs.1, 2 and 3 /3); was the larger of the two tributaries forming the hepatic portal vein. It was a short vessel measuring about 0.5 cm. It was formed by the confluence of three main tributaries; the proventriculosplenic, the gastropancreaticoduodenal and the common mesenteric veins.

V. proventriculosplenica:

The proventriculosplenic vein (figs. 2 and 3 /7); a long vein was formed by the union between the splenic vein and the right proventricular vein, then continued caudoventrally to join the craniodorsal aspect of the right hepatic portal vein.

V. splenica:

The splenic vein (fig. 2 /8); was a very short vessel about 0.3 cm. in length that leaved the ventromedial aspect of the spleen and joined the dorsal aspect of proventriculosplenic vein.

V. proventricularis dextra:

The right proventricular vein (figs. 2 and 3 /9), from its size and course, was considered as the main contribution to the proventriculosplenic vein. It was formed by the union of 2 -3 fine twigs at the junction between glandular and muscular stomachs. It proceeded cranioventrally to drain from the caudal third of the glandular stomach. Along its course, it received middle and cranial tributaries which drained the blood from glandular stomach. Rdx. medius cum V. proventricularis dextra (figs. 2 and 3 /11); drained from the middle third of the glandular stomach by 2-3 small tributaries, while Rdx. cranialis cum V. proventricularis dextra (figs. 2 and 3 /10); drained from the cranial third of the glandular stomach and the terminal part of esophagus by 3-4 small twigs.

V. gastropancreaticoduodenalis:

The gastropancreaticoduodenal vein (figs. 1, 2 and 3 /12); was a long tributary, measured about 4-5 cm. in length, and formed by the union of the right gastric and the pancreaticoduodenal veins. It was insinuated between the ascending part of the duodenum and the right side of the muscular stomach, and then extended obliquely cranioventrally to join the ventral aspect of the right hepatic portal vein.

V. gastrica dextra:

The right gastric vein (figs. 1 and 2 /13); was a small tributary, measured about 1.5 cm. in length, and formed by the union of 3-4 vessels drained from the right aspect of the muscular stomach, then proceeded cranioventrally to open in the left lateral aspect of the gastropancreaticoduodenal vein. Just before its termination,

it receives V. sacci cranialis (fig 2/14) and V. sacci caudalis (fig 2/15) from the pyloric part of the stomach.

V. pancreaticoduodenalis:

The pancreaticoduodenal vein (figs.1 and 2/16); from its size and course was considered as the main drainage of the gastropancreaticoduodenal vein. It passes cranially between the pancreas and the two limbs of the duodenum in the pancreaticoduodenal ligament. During its course, it receives the V. pylorica (fig 2/17) from the pyloric opening of the stomach and initial part of the descending duodenum, Vv. Pancreaticae (fig. 2/18) from the pancreas and Vv. duodenales (fig. 2/19) from different parts of duodenal loop.

V. mesenterica communis:

The common mesenteric vein (figs.2, 3 and 4/20); was the main tributary of the right hepatic portal vein and measured about 2.5 cm. in length. The common mesenteric vein was formed by the union of the cranial mesenteric vein and the cranial tributary of the caudal mesenteric vein just dorsal to the duodenojejunal flexure. It drained the intestinal tract from the jejunum till the cloaca.

V. mesenterica cranialis:

The cranial mesenteric vein (figs. 2, 3 and 4 /21); was a short stout vessel embedded in the mesojejunum. It formed by the union of 8-10 jejunal veins. It was insinuated between the cranial tributary of the caudal mesenteric and the common mesenteric veins. Vv. jejunales (figs. 2, 3 and 4 /22); were 8-10 veins that formed by the union of the veins forming the intestinal arches (fig. 3 /23). The latter vessels were formed by the union of the small secondary jejunal tributaries that originated from the wall of jejunum. The jejunal veins passed in a radial manner in the mesojejunum to join each other forming the cranial mesenteric vein.

V. mesenterica caudalis:

The caudal mesenteric vein (fig. 4 /24); was a short stout vessel, measuring about 1.5 cm. and formed by the union of a cranial and a caudal tributaries. It joined the interiliac anastomosis dorsocaudally.

Rdx. cranialis cum V.mesenterica caudalis:

The cranial tributary of the caudal mesenteric vein (figs. 2, 3 and 4 /25); was larger than the caudal one and extended cranioventrally towards the common mesenteric vein close to the colorectum. Along its course it received the ileocecal vein as well as 8-10 short fines. Vv. rectales (fig. 4 /26); from dorsal surface of the colorectum. The cranial tributary of the caudal mesenteric vein joined the common mesenteric vein cranially.

V. ileocecalis:

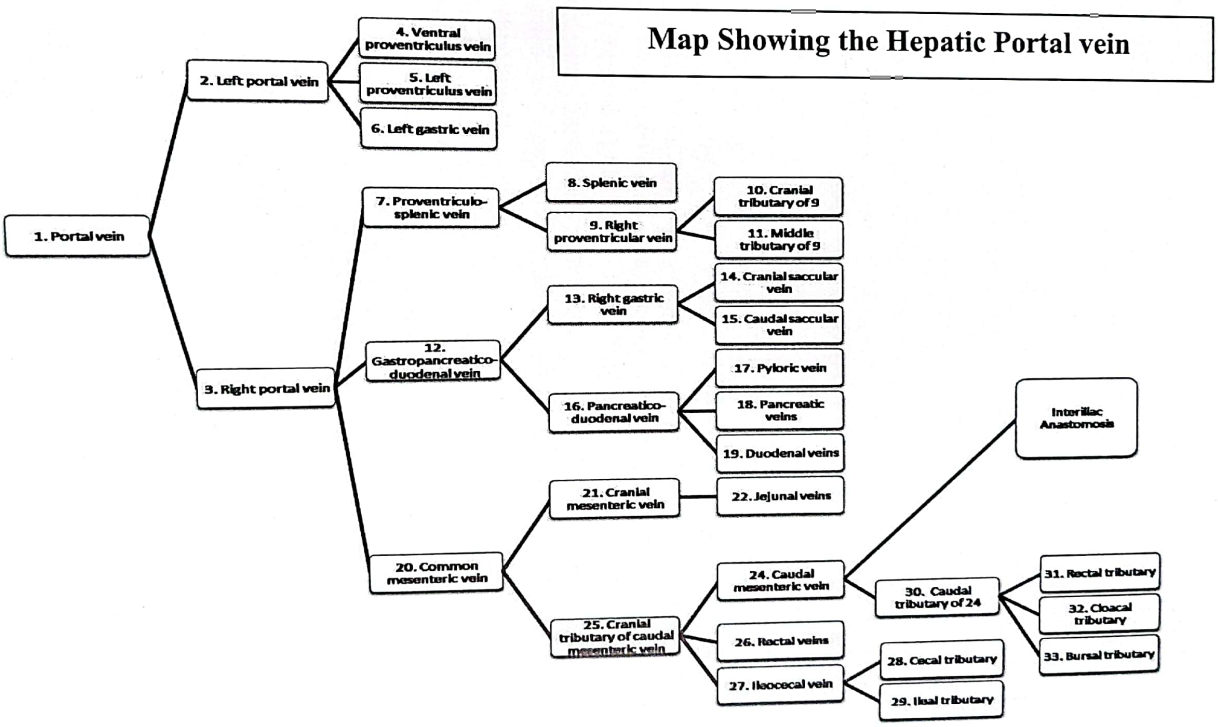
The ileocecal vein **(figs. 2 and 4 /27);** was a long thin vessel, measured about 2-2.5 cm. It joined the ventral aspect of the cranial tributary of the caudal mesenteric vein, just before its junction with the cranial mesenteric vein. It drained the left cecum by **cecal tributary (figs. 2 and 4 /28)** through 4-5 small venules and the ileum by **ileal tributary (figs. 2 and 4 /29)** through 2-3 small venules.

Rdx. caudalis cum V. mesenterica caudalis:

The caudal tributary of the caudal mesenteric vein **(fig. 4 /30);** was a small vessel that formed by the union of **rectal tributary (fig. 4 /31), cloacal tributary (fig. 4 /32)** and **bursal tributary (fig. 4 /33)** draining the colorectum, coloaca and cloacal bursa respectively. It then extended dorsocranially to join the caudoventral aspect of the caudal mesenteric vein.

Anastomosis interiliaca:

The interiliac anastomosis **(fig. 4 /34);** was drained into the caudal mesenteric vein and formed by the anastomosis between the two internal iliac veins. The **Vv. iliaca interna (figs.1, 2, 3 and 4 /35)** proceeded cranially beyond the interiliac anatomosis to receive the **Vv. ischiadica (fig. 2 /36).** The two internal iliac veins then joined the **Vv. iliaca externa (figs.1, 2 and 4 /35)** to form the **Vv. iliaca communis (figs.1, 2, 3 and 4 /38)**. The two common iliac veins receives the **Vv. renales (figs.1, 2 and 4 /39)** then joined each other to form the **Vena cava caudalis (figs.1,2and3/40)**


Map Showing the Hepatic Portal vein
1. Portal vein
2. Left portal vein
4. Ventral proventriculus vein
5. Left proventriculus vein
6. Left gastric vein
3. Right portal vein
7. Proventriculo-splenic vein
8. Splenic vein
9. Right proventricular vein
10. Cranial tributary of 9
11. Middle tributary of 9
12. Gastropancreatico-duodenal vein
13. Right gastric vein
14. Cranial saccular vein
15. Caudal saccular vein
16. Pancreatico-duodenal vein
17. Pyloric vein
18. Pancreatic veins
19. Duodenal veins
20. Common mesenteric vein
21. Cranial mesenteric vein
22. Jejunal veins
25. Cranial tributary of caudal mesenteric vein
24. Caudal mesenteric vein
Interiliac Anastomosis
30. Caudal tributary of 24
31. Rectal tributary
32. Cloacal tributary
33. Bursal tributary
26. Rectal veins
27. Ileocecal vein
28. Cecal tributary
29. Ileal tributary

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Legends of Figures 1-5

1. V. hepatica porta	21. V. mesenterica cranialis	A. Liver
2. V. hepatica porta sinistra	22. Vv. jejunales	B. Spleen
3. V. hepatica porta dextra	23. Archus intestinalis	C. Esophagus
4. V. proventricularis ventralis	24. V. mesenterica caudalis	D. Glandular stomach
5. V. proventricularis sinistra	25. Rdx. cranialis cum V. mesenterica caudalis	E. Muscular stomach
6. V. gastrica sinistra	26. Vv. rectales	F. Pars pylorica (3rd stomach)
7. V. proventriculosplenic	27. V. ileocecalis	G. Descending duodenum
8. V. splenica	28. Cecal tributary of 27	H. Ascending duodenum
9. V. proventricularis dextra	29. Ileal tributary of 27	I. Pancreas
10. Rdx. cranialis cum V. proventricularis dextra	30. Rdx. caudalis cum V. mesenterica caudalis	J. Jejunum
11. Rdx. medius cum V. proventricularis dextra	31. Rectal tributary of 30	K. Ileum
12. V. gastropancreaticoduodenalis	32. Cloacal tributary of 30	L. Left cecum
13. V. gastrica dextra	33.Bursal tributary of 30	M. Colorectum
14. V. sacci cranialis	34. Anastomosis interiliaca	N. Coloaca
15. V. sacci caudalis	35. V. iliaca interna	O. Coloacal bursa
16. V. pancreaticoduodenalis	36. V. ischiadica	P. Kidney
17. V. pylorica	37. V. iliaca externa	
18. Vv. pancreaticae	38. V. iliaca communis	
19. Vv. Duodenales	39. Vv. Renales	
20. V. mesenterica communis	40. Vena cava caudalis	

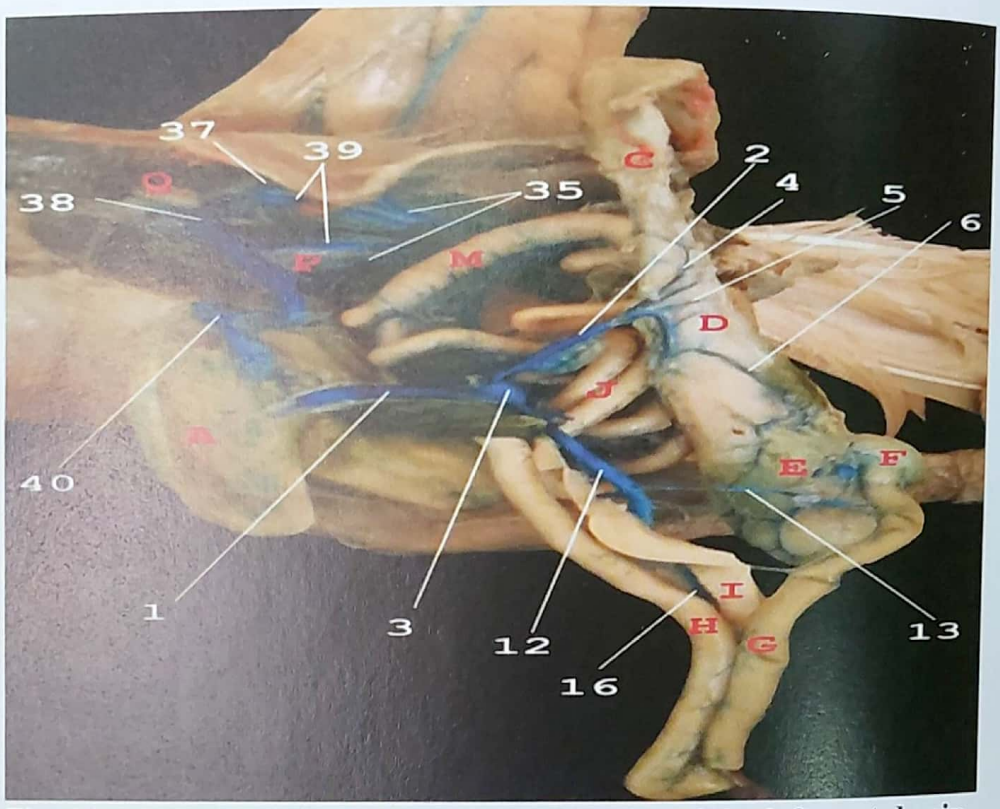

Fig. (1): A photograph showing the tributaries of the left portal vein.

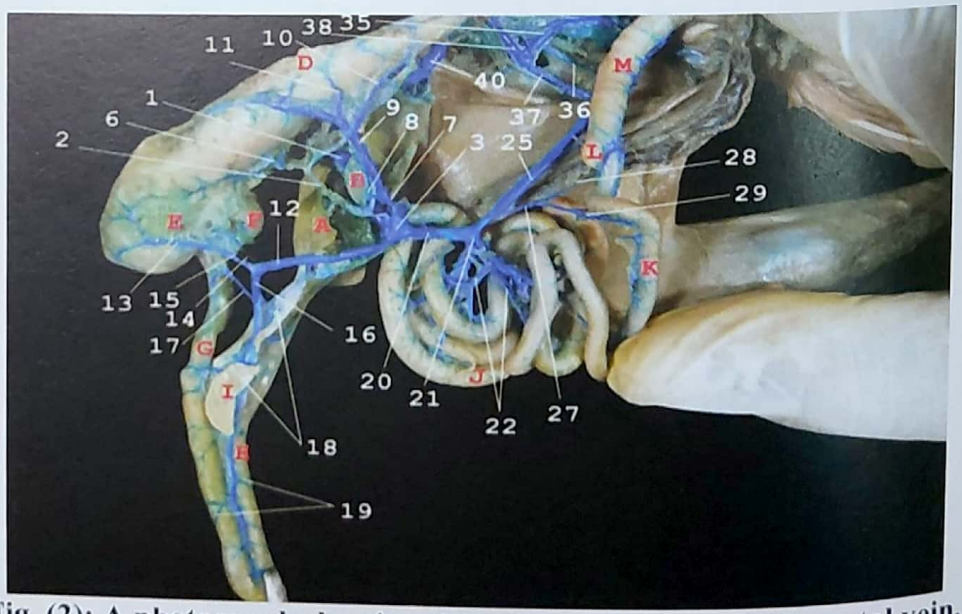

Fig. (2): A photograph showing the tributaries of the right portal vein.

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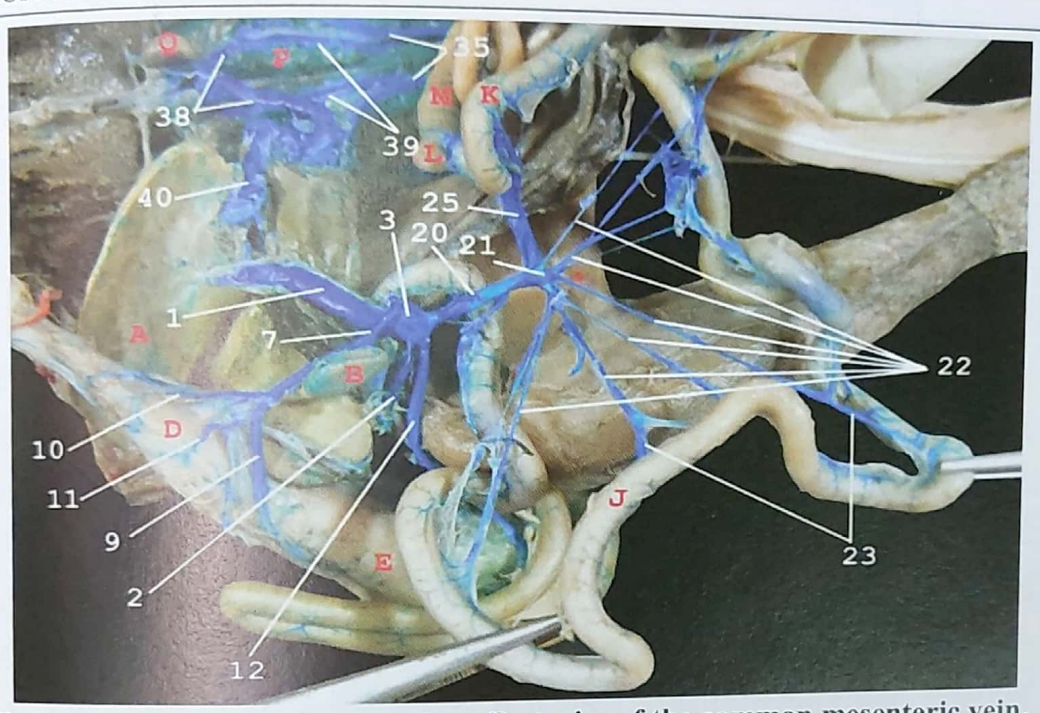

Fig. (3): A photograph showing the tributaries of the common mesenteric vein.

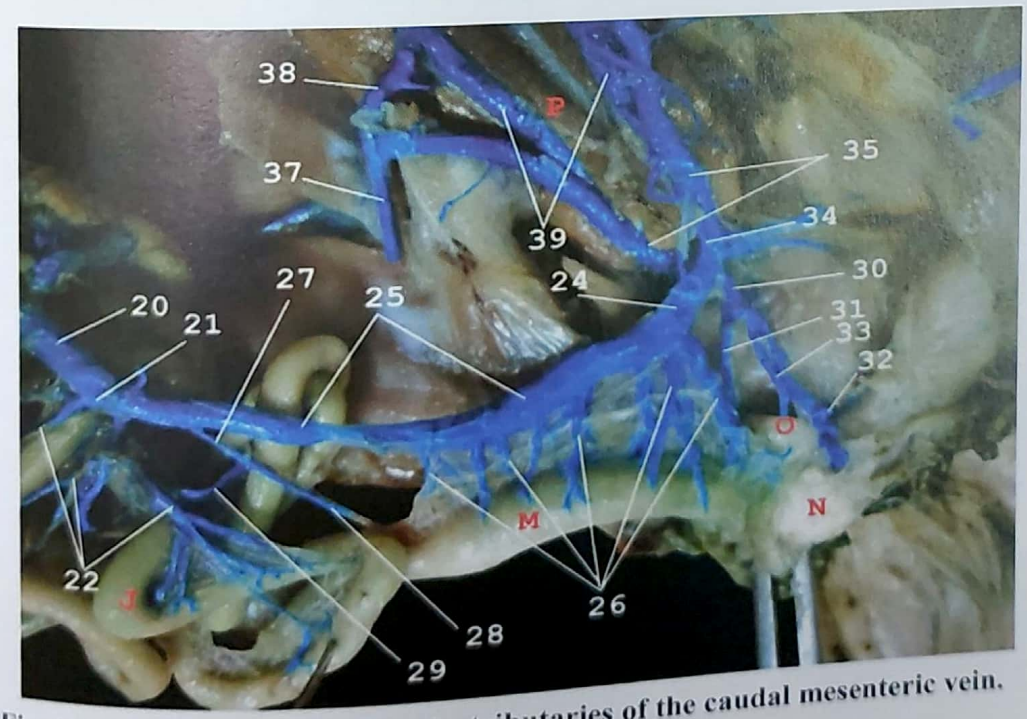

Fig. (4): A photograph showing the tributaries of the caudal mesenteric vein.

Discussion

The present study revealed that the hepatic portal venous system was formed by the confluence of two hepatic portal veins; the large right and the small left veins. This statement was agreed with that represented by El karmoty, (2014) in ducks and geese, Santos et al. (2009) in geese, Pinto et al., (1999) in duck, Nickel et al., (1977) in birds and Malinovsky, (1965) and Oliveira, (1959) in chicken. On the other hand, Jiaji (1997) in goose and duck observed that the corresponding venous system was formed by two left and one right hepatic portal veins.

The current investigation in agreement with Nishida et al., (1969) in fowl who reported that the left hepatic portal vein drained the glandular and muscular stomachs through, the ventral proventriculus, the left proventriculus and the left gastric veins. On the other hand Pinto et al., (1999) in duck declared that the left hepatic portal vein was formed by 1- 2 left gastric veins that drained the ventral margin of the gizzard in addition to the pyloric and the caudal proventricular veins. While Malinovsky, (1965) and Oliveira, (1959) in chicken recorded that the left hepatic vein was formed by the ventral gastric, the left gastric and the caudal proventricular veins.

In viewing the present finding, the tributaries of the right hepatic portal vein were the proventriculosplenic, the gastropancreaticoduodenal and the common mesenteric veins. These results were in accordance to Nishida et al., (1969) in fowl. In contrary with El karmoty, (2014) in ducks and geese, Pinto et al., (1999) in duck, Malinovsky, (1965) in fowl and Oliveira (1959) in chicken, reported that the tributaries of the

right hepatic portal vein were the gastropancreaticoduodenal and the common mesenteric veins. While El karmoty, (2014) in ducks and geese, added more tributaries named the gall bladder and the duodenojejunal veins.

The results under discussion and Nishida et al., (1969) in fowl assessed that the splenic and right proventricular vein joined the right hepatic portal vein by common trunk called proventriculosplenic vein, while El karmoty, (2014) in ducks and geese recorded that the two latter veins joined from right hepatic portal vein separately.

Concerning the formation of the gastro pancreatico duodenal vein in the cattle egret by the union of the right gastric and pancreaticoduodenal veins, similar results were recorded by Malinovsky (1965) and Oliveira (1959) in chicken. Moreover, El karmoty, (2014) in ducks and geese and Nickel et al. (1977) in birds added the jejunal veins as main tributaries forming the gastropancreaticoduodenal vein. It might be added that, Pinto et al., (1999) in duck that two right gastric veins sharing with the pancreaticoduodenal in forming this vessel.

In the cattle egret as well as in duck and geese (El karmoty, 2014), the common mesenteric vein was formed by the union of the continuity of the larger cranial tributary of the caudal mesenteric vein and the cranial mesenteric vein between the jejunal loops. In this connection Pinto et al., (1999) in duck and Malinovsky, (1965) and Oliveira, (1959) in chicken

recorded that the current vein was formed by the union established between the cranial and caudal mesenteric veins.

The present investigation declared that the cranial mesenteric vein was a stout and very short vessel where it formed by the union of 8-10 jejunal veins. On the other hand, El karmoty, (2014) in ducks revealed that the cranial mesenteric vein drained also ileal, ileocecal in addition to 25-28 jejunal veins, while Pinto et al., (1999) revealed that the cranial mesenteric vein drained 12 – 21 jejunal tributaries. El karmoty, (2014) in geese added that the cranial mesenteric vein drained ileocecal and 19-21 jejunal veins.

The formation of the caudal mesenteric vein by the confluence of the larger cranial and the smaller caudal tributaries mentioned in the present study was the common pattern as revealed by El karmoty, (2014) in ducks and geese, Nickel et al., (1977) in birds and Malinovsky (1965) and Oliveira (1959) in chicken.

The ileocecal vein in the cattle egret is a branch of the cranial tributary of the caudal mesenteric vein, in contrast to the opinion reported by El karmoty, (2014) in ducks and geese, that the ileocecal vein was a tributary of the cranial mesenteric vein.

The caudal tributary of the caudal mesenteric vein drained from colorectum, terminal part of the coloaca and cloacal bursa through rectal, coloacal and bursal veins in accordance with Pinto et al. (1999) in duck.

The interiliac anastomosis in the present investigation was similar to that mentioned by Baumel (1993) in domestic fowl and Elias et al. (2008) in ostrich as a communication between the renal and hepatic portal circulations. The presence of this anastomosis allowed blood to flow from the caudal mesenteric veins to the internal iliac cranially to the common iliac veins then directly to caudal vena cava. Alternatively, it allowed venous blood from the pelvic limb could be directed from the external iliac vein caudally toward the caudal mesenteric vein that leaded to hepatic portal vein.

Conclusion

This investigation provided an anatomical guide to the venous drainage of gastrointestinal tract in cattle egret which differed to some extent from other domestic birds. These domestic birds were used as a guide for nomenclature of veins according to the drainage of relative parts of gastrointestinal tract.

The small left hepatic portal vein drained blood from parts of glandular and muscular stomachs while the large right hepatic portal vein drained blood from the rest of the gastrointestinal tract and spleen. These two veins form the main hepatic portal vein.

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دراسة تشريحية عيانية على روافد الوريد البابى الكبدى فى أبو قردان

السيد فتح خليفة - سامر محمد دغش

قسم التشريح والأجنة – كلية الطب البيطري – جامعة القاهرة

أجري البحث على الوريد البابى الكبدى فى عشر عينات من طائر أبو قردان سليمة ناضجة من الجنسين لأجل الدراسة التشريحية. عولجت العينات التي إستخدمت للدراسة التشريحية، بعد ذبحها وإستنزافها للتخلص من بقايا الدم فى أوعيتها الدموية, ثم حقنها بالوسائل الروتينية بمحلول اللاتكس نيوبرين الملون باللون الأزرق ثم حفظت فى خليط من الفورمالين 10%, الفينول 4% والجليسرين 1% وتم تشريح العينات المحقونة بدقة بعد ثلاثة ايام. وقد تبين من الدراسة ان الوريد البابى الكبدى الأيسر يستقبل الدم من المعدة عن طريق ثلاثة أوردة هى: الوريد المعدى الغدى البطنى والوريد المعدى الغدى الأيسر والوريد المعدى الأيسر بينما يستقبل الوريد البابى الكبدى الأيمن الدم من معظم أجزاء السبيل المعدى المعوى وأيضا الطحال عن طريق ثلاثة أوردة هى: الوريد الغدى المعدى الطحالى والوريد المعدى المعثكلى العفجى والوريد المساريقى المشترك. وقد تم وصف منشأ ومسار وتوزيع هذه الاوردة بدقة وتم إعتماد المسميات واستخدام المصطلحات التشريحية البيطرية الدولية للطيور لسنة 1993 في تسمية الاوردة. وقد تم تزويد الدراسة بأربع صور للعينات بعد تشريحها وذلك لتوضيح النتائج. كما نوقشت النتائج المتاحة في الدراسة مع ما تم الحصول عليه في الاعمال السابقة في الطيور المستأنسة.