

VENOUS DRAINAGE OF THE GASTROINTESTINAL TRACT IN THE GOAT

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INTRODUCTION

The venous drainage of the gastrointestinal tract in the goat was given by Horowitz/Venzke (1966). Their description was inadequate. In the present work aims to give some extended informations regarding the origin, course and distribution of the veins to the various parts of the gastrointestinal tract in the goat, which may be of help to those dealing in some medical practice confined to such a tract.

MATERIAL AND METHODS

The present study was carried out on 15 adult healthy goats of both sexes and of different ages. The animals were thoroughly bled, and an incision through the abdominal wall, via the Linea alba was performed. The portal vein was ligated at the porta hepatis and its tributaries were thoroughly washed by warm normal saline in a retrograde manner by pumping the solution several times, then followed by in-

jecting 60% Gum milk (latex) colored blue. The stomach and intestinal tract were then removed from the abdominal cavity, and fixed in 10% formaline for about 2 to 3 days, then carefully dissected, making use of a magnifying lens, whenever needed. The nomenclature used was that adopted according to the N.A.V. (1983).

RESULTS

Venous drainage of the gastrointestinal tract of the goat was achieved via the three main vessels; V. gastroduodenalis, V. lienalis and V. mesenterica cranialis, which are the main tributaries of the V. portae.

I-V. gastroduodenalis (Fig. 1/2): A considerable branch, given from the R. sinister of the V. portae (Figs 1/1 & 2/1), 2 cm. caudal to the porta hepatis. It gave the V. pancreaticoduodenalis cranialis (Fig. 1/3) that reached the sigmoid loop of the cranial portion of the duodenum which it drained and anastomosed with V. pancreaticod-

uodenalis caudalis. It continued along the cranial part of the duodenum and soon bifurcated into V. gastrica dextra and V. gastroepiploica dextra.

1-V. Gastrica dextra (Figs 1/4 & 3/2): Continued on the cranial part of the duodenum towards the abomasum, and about 1.5 - 2 cm. from the pylorus, it divided into two main branches for both sides of the lesser curvature of the abomasum. Each detached 4 to 5 gastric branches for the body and pylorus of the abomasum. They anastomosed with the corresponding ones of the V. gastrica sinistra. In addition, it sent off 6 to 7 duodenal branches, confined to vascularize the cranial part of the duodenum.

2-V. Gastroepiploica dextra (Figs 1/5 & 2/8): The second branch is long, being about 28-30 cm. in length, continued along the cranial part of the duodenum. It released from 5 to 6 small duodenal branches and on reaching the greater curvature of the abomasum, it detached from 10 to 12 gastric branches for the abomasum and 7 to 8 epiploics for the greater omentum. In this connection, it may be pointed out that, a conspicuous network of venous anastomosis within the entire wall of the abomasum, could be traced in all the examined specimens (Fig. 3/A). Such an anastomosis was collectively formed between the gastric branches of both the right and left gastric and similar right and left gastroepi-

ploic veins.

II-V. Lienalis (Figs 1/6 & 2/2) A large vessel of about 4 to 4.5 cm in length, derived at a right angle from the V. portae. It proceeded medially toward the rumen, releasing the following tributaries.

1-V. Ruminalis dextra (Figs 1/ & 2/3): A long vessel, running medially to the right aspect of the Atrium ruminis, where it gave small splenic vein. It then continued into the right longitudinal anastomosis in the caudal transverse groove, pursued for about 10 to 12 cm. on the left face of the caudal ventral ruminal sac, where it gave about 14 to 15 short vessels for both caudal ruminal blind sacs, in addition to the right aspect of the dorsal and ventral ruminal sacs.

2-V. Reticularis (Figs. 1/8 & 2/4): proceeded medially to the Atrium ruminis and within the rumenoreticular groove it terminated into 3 to 4 small twigs on the visceral surface of the reticulum. During its course, it gave from 7 to 8 offshoots for the Atrium and cardiac orifice in addition to the adjacent portion of the dorsal ruminal sac.

3-V. Ruminalis sinistra (Figs 1 & 2/5): A long vessel traversing the cranial transverse groove to gain the left longitudinal anastomosis where it detached 7 to 8 short dorsal and ventral branches, which drained the ruminal sacs except the

caudal ventral blind one which was already supplied by the terminal branches of the *V. ruminalis dextra*.

It was observed that the branches of both the *V. ruminalis dextra* and *sinistra* don't reach the curvatures of the rumen, but they only anastomosed with each other on the left aspect of the caudal dorsal blind sac. Through its course, the *V. ruminalis sinistra*, released a slender *V. oesophagea caudalis* (Fig. 1/10), that ran craniodorsally to the terminal portion of the oesophagus as well as the cardiac orifice. Moreover, but only in one specimen, such a vessel, was observed to be derived from the *V. reticularis*.

4-*V. gastrica sinistra* (Figs 1/11 & 2/6): It constituted the direct continuation of the *V. lienalis*, after the latter vessel gave off the *V. ruminalis sinistra*. It soon bifurcated into *R. dexter* and *R. sinister*. The former (Fig. 1/12), promptly issued a considerable *R. reticularis*, then continued on the craniodorsal wall of the omasum to gain the lesser curvature of the abomasum. Along its course, the *R. dexter* detached 3 to 4 gastric branches that supply the entire wall of the omasum. Furthermore, at the omaso-abomasal junction, it divided into 4 to 5 considerable vessels to the lesser curvature of the abomasum which they drained. They anastomosed with similar rami of the *V. gastrica*

dextra. Concerning the reticular branch of the *R. dexter* (Figs 1/4 & 2/7), was observed that it proceeded cranioventrally to vascularize the dorsal and left walls of the reticulum as well as the adjacent ventral portion of the omasum in addition to the omasal column, via 3 to 4 relatively long branches. Also, it was observed that, the diaphragmatic surface of the reticulum was devoid of any branches.

the *R. sinister* (Fig. 1/13): Passed across the left omasal surface to gain the greater curvature of the abomasum to be continued as the *V. gastroepiploica sinistra* (Figs 1/15 & 3/1), where it supplied the fundus, body of the abomasum and adjacent part of the omasum by 10 to 12 small gastric branches. In addition, it detached 7 to 8 epiploic branches and terminated by anastomosing with the *V. gastroepiploica dextra*.

III-V. mesentrica cranialis (Figs 1/16 & 2/9): Constituted the caudal continuation of the *V. portae*. It, immediately sent off a slender *V. pancreaticoduodenalis caudalis* and the *V. mesentrica caudalis*, then trifurcated into, *V. jejunalis*, *V. colica dextra* and *V. ileocolica*.

1-*V. Pancreaticoduodenalis caudalis* (Fig. 1/7) ran on the cranial portion of the duodenum to establish anastomoses with the corresponding cranial one.

2-V. Mesentrica caudalis (Fig. 1/18): Left the parent vessel opposite to the origin of the V. pancreaticoduodenalis caudalis. It released the V. colica media and then continued, caudally, as V. colica sinistra. The former (Fig. 1/19), supplied the distal loop of the ascending colon and the initial portion of the transverse colon via 2 to 3 fine tributaries. The latter (Fig. 1/20), ran caudally on the mesentric border of the descending colon supplying it by 7 to 10 small twigs, in addition to 2 to 3 fine Vv. sigmoideae to the sigmoid colon. It terminated on the dorsal aspect of the rectum, constituting the V. rectalis cranialis (Fig. 1/21).

3-V. Jejunalis (Figs 1/22 & 2/13): Was a relatively large and long trunk (about 30 cm.), that drained the jejunum through 17 to 20 Rr. Jejunales constituting an arcade manner. The last ramus, continued on the mesentric border of the ileum and anastomosed with the V. ilealis of the V. ileocolica. Moreover, 2 to 3 small branches were derived from the V. jejunalis to drain the adjacent portion of the centrifugal coils of the ascending colon and to establish anastomoses with branches from the V. colica dextra. It may be added that, in two specimens, two Rr. jejunales were observed to arise directly from the V. mesentrica cranialis opposite to the origin of the V. mesentrica caudalis.

4-V. Colica dextra (Figs 1/23 & 2/12): Descent to vascularize the spiral loop of the ascending colon particularly the centrifugal one, via 8 to 10 considerable branches. In addition to the preceding tributaries, the V. colica dextra released a relatively long branch to drain the distal loop of the ascending colon as well as the transverse colon and to anastomose with the counterparts of the V. colica media.

5-V. ileocolica (Figs 1/24 & 2/10): A long vessel of about 20 to 22 cm., directed toward the base of the caecum where it issued a R. colicus (Fig. 1/23). It continued along the mesentric border of the caecum sending 12 to 15 small Vv. caecales (Figs 1/26 & 2/11) to the caecum, the V. ilealis to the ileum, then continued distally to terminate by 3 to 4 small branches to anastomose with the last Rr. jejunales.

The V. ilealis (Fig. 1/27) gained the mesentric border of the ileum and coursed ventrally to anastomose with the last R. jejunalis.

From the distribution pattern of the veins in the stomach of goat, it was observed that the surgical interference, if necessary, could be performed in the dorsal and ventral curvatures of the rumen, in the diaphragmatic surface of the reticulum and in no area of the omasal and abomasal walls in order to avoid any undesired bleeding during the operation.

DISCUSSION

The V. ruminalis dextra of the present study drains only the rumen. Ghoshal, Koch and Popesko (1981) and Wilkens and Munster (1981) in ruminants in addition to Horowitz and Venzke (1966) in the goat observed a R. collateralis limiting the Insula ruminis. Such a collateral branch was not seen in the goat of the present work. The latter two authors in addition to Heath (1968) in sheep observed that the V. gastrica sinistra collects blood from the left ruminal face and left aspect of the reticulum. However, in the present material, these organs were drained by the V. ruminalis sinistra and V. reticularis sinistra, respectively.

The V. gastrica dextra in the goat drained the duodenum and abomasum and unite with the V. gastrica sinistra over the lesser curvature of the abomasum. On the other hand, Smuts and Bezuidenhout (1987) added that, such a vessel drained also, the omasum and reticulum and anastomosed with the corresponding left one on the lesser curvature of the reticulum.

The division of the V. mesentrica cranialis into the V. jejunalis, V. colica dextra and V. ileocolica was also seen by Ghoshal, et al. (1981) and Wilkens and Munster (1981) in ruminants. On the other hand, the consideration of the vessel to be formed by the V. duodenojejunalis and V. jejunalis in the rabbit

(Yadm and Gad, 1992) could not be accepted in the present work.

The presence of the V. mesentrica caudalis as a tributary of the V. portae in domestic animals as seen by Ghoshal, et al. (1981) and Wilkens and Munster (1981), in addition to Yadm and Gad (1992) in the rabbit, could not be accepted in the goat under investigation, since it was released from the V. mesentrica cranialis. Such an observation was also given by Ghoshal, et al. (1981) in ruminants and Smuts and Bezuidenhout (1987) in the camel. In addition, the last two authors stated that the V. mesentrica caudalis was performed by the union of the V. colica sinistra and V. rectalis cranialis. It is to add that, in the goat, the V. mesentrica caudalis was formed by the V. colica sinistra and V. colica media, while the V. rectalis cranialis constituted the caudal continuation of the V. colica sinistra. The great amount of venous drainage of the abomasum and jejunum in the goat seems to be of importance during physiological activities done by both organs in digestive and absorptive processes.

SUMMARY

The venous drainage of the gastrointestinal tract in the goat was performed by means of three main vessels; V. gastroduodenalis, V. lienalis and V. mesentrica cranialis. The former, vascularized the duodenum and abomasum. The V. lienalis drained the four compartments of the

stomach. The V. mesentrica cranialis conveyed the venous blood from the small intestine and the ascending colon. The present study revealed that, the venous blood of the transverse and descending colons was drained by the V. mesentrica caudalis which is considered as a collateral branch of the V. mesentrica cranialis. The study also demonstrated a considerable amount of venous anastomoses within the entire wall of the abomasum, formed between the gastric branches of the V. gastrica sinistra, V. gastroepiploica sinistra, V. gastrica dextra and V. gastroepiploica dextra. The suitable sites for surgical approach in case of ruminal and reticular affections were also described.

LEGENDS

Fig. 1: Diagrammatic representation showing the venous drainage of the gastrointestinal tract in the goat: 1-V. portae. 2-V. gastroduodenalis. 3-V. pancreaticoduodenalis cranialis. 4-V. gastrica dextra. 5-V. gastroepiploica dextra. 6-V. Lienalis. 7-V. Ruminalis dextra. 8-V. Reticularis. 9-V. Ruminalis sinistra. 10-V. Oesophagea caudalis 11-V. gastrica sinistra. 12-#. dexter of (11). 13-R. Sinister of (11). 14-R. Reticularis of (12). 15-V. Gastroepiploica sinistra. 16-V. Mesentrica cranialis. 17-V. Pancreaticoduodenalis caudalis. 18-V. Mesentrica caudalis. 19-V. Colica media. 20-V. Colica sinistra. 21-V. Rectalis cranialis. 22-V. Jejunalis. 23-V. Colica dextra. 24-V. Ileocolica. 25-R. Colicus of (24). 26-Vv. Caecalis. 27-V. Ilealis. A-Saccus dorsalis of rumen. B-Saccus ventralis of rumen. C-Spleen. D-Reticulum E-Omasum. F-Abomasum. G-Pars

cranialis of duodenum. H-Jejunum. I-Ileum. J.-Cecum. K-Ansa proximalis coli. L-Ansa spiralis coli. M-Ansa distalis coli. N-Colon transversum. O-Colon descendens. p-Colon sigmoideum. Q-Rectum. R-Liver.

Fig. 2: Photographic representation showing the veins draining the gastrointestinal tract in the goat, (The omasum and abomasum are reflected dorsally and the caecum is displaced to the left side to expose the insinuated vessels): 1-V. portae. 2-V. Lienalis. 3-V. Ruminalis dextra. 4-V. Reticularis. 5-V. Ruminalis sinistra. 6-V. Gastrica sinistra. 7-R. Reticularis of (6). 8-Gastroepiploica dextra. 9-V. Mesentrica cranialis. 10-V. Ileocolica. 11-Vv. Caecalis. 12-V. Colica dextra. 13-V. Colica dextra. 13-V. Jejunalis. 14-V. Cava caudalis. A-Saccus dorsalis of rumen. B-Saccus ventralis of rumen. C-spleen. D-Reticulum. E-Omasum. F-Abomasum. G-Liver. H-Colon transversum. I-Jejunum. J-Caecum. K-Ansa spiralis coli.

Fig. 3: Photographic representation showing a network of intervenous anastomoses within the wall of the abomasum of the goat, ventral view: 1-V. Gastroepiploica sinistra. 2-V. Gastrica dextra. A-Abomasum. B-Omasum.

Fig. 4: Photographic representation showing the suitable site for surgical approach in rumenotomy

operation.

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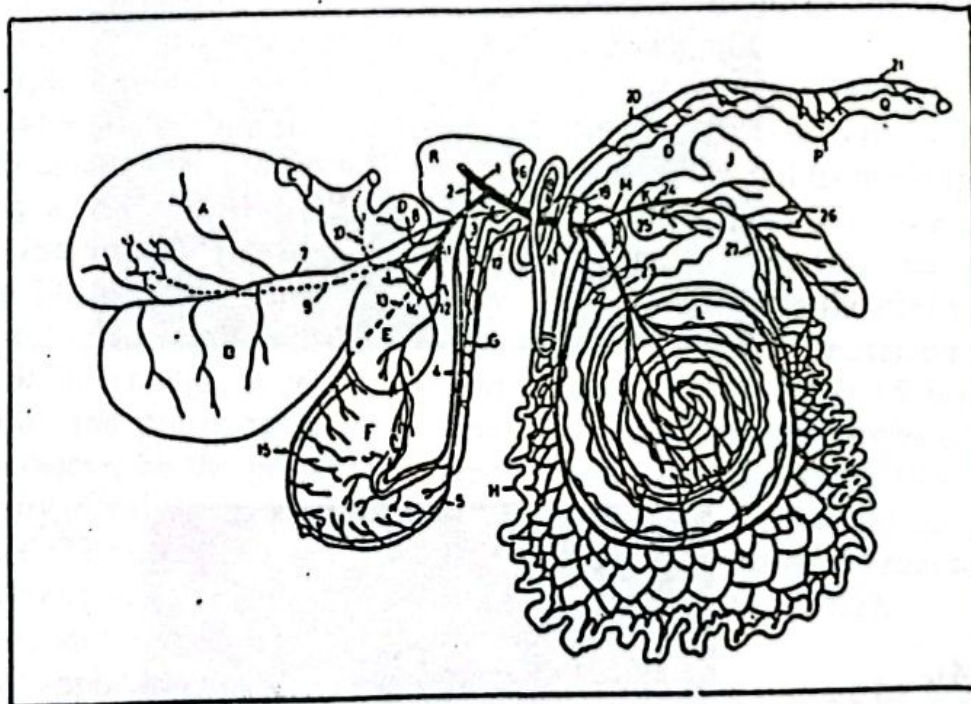


Fig. (1) .

Fig.(2).



Fig.(3).

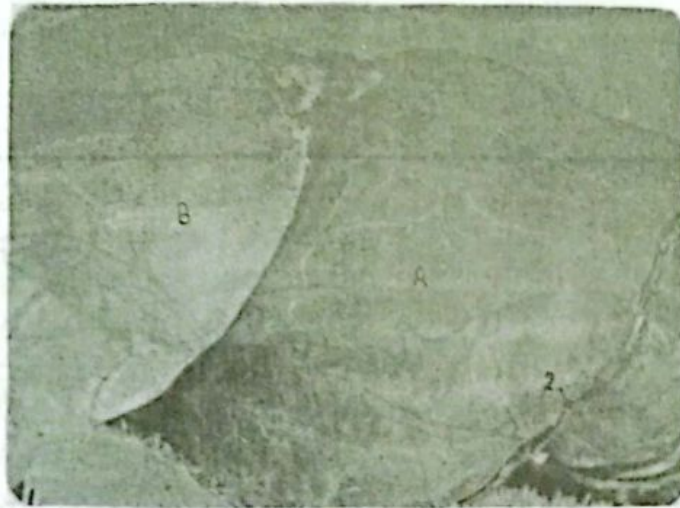


Fig.(4).

