Correlations between the colic branches of the mesenteric arteries and the vascular territories of the colon

M. C. NICULESCU, V. NICULESCU, IULIA-CAMELIA CIOBANU, ECATERINA DĂESCU, ADELINA JIANU, ALINA-MARIA ŞIŞU, CODRUŢA-ILEANA PETRESCU, A. MOTOC

Department of Anatomy and Embryology,
"Victor Babeş" University of Medicine and Pharmacy, Timişoara

Abstract

The study, done on 100 corpses from the dissection rooms of anatomy laboratory, hinted the morphological variability of the colic arteries and their territories. Morphological variability of the colic branches derived from the mesenteric arteries (superior right colic artery – 98%; middle right colic artery – 88%; inferior right colic artery – 100%; middle colic artery – 36%; superior left colic artery – 100%; middle left colic artery – 50%; inferior left colic artery – 100%) allows us to give out a morphogenetic supposition related their ramification and number. Analyze of the results guide us to a tentative of setting down the vascular territories of the colon. In the beginning were established the territories of the mesenteric arteries (superior and inferior) and after that, were marked the subterritories for each colic artery. Establishing the vascular territories of the colic arteries have not only anatomical importance but also a surgical one, been known the difficult postoperatory colon's revitalization.

Keywords: *colic branches, mesenteric arteries, vascular territories.*

Introduction

This work represents a synthesis of numerous published studies, being the object of our research. We consider that through this work we are going to succeed in bringing a modest contribution to establish the morphological variability of the colic arteries and the vascular territorialisation of the colon. From the classical point of view, the caecum derives from the middle embryonic intestine, the ascending colon and the two right thirds of transverse colon, together being irrigated by the superior mesenteric artery. The posterior embryonic intestine gets birth to the left 3rd of transverse colon, descending colon, sigmoid colon, and rectum, irrigated by the inferior mesenteric artery [1, 2].

We found a diagram, which divides the colon in four vascular territories belonging to the colic arteries: right inferior, right superior, left superior and left inferior [3–6].

Morphological variability of the colic arterial branches lead us through the study of the vascular territories which variability presents not only anatomic importance but also practical and surgical importance [7–10].

Although the colic branches get anastomoses on the length of marginal arches (Riolan, Mondor), the anatomic aspect does not show all the time a functional anastomosis and, so, we must accept the idea of existence a precise territory dependent on a certain artery [9, 10].

Material and methods

The study made on 100 corpses from the dissection rooms and on 10 fetuses and newborn corpses, wants to elucidate the number and the origin of the colic branches of mesenteric arteries (superior and inferior).

We used the method of dissection and injection. The obtained data were centralized, analyzed, discussed and processed statistically mathematic. The results allow us to set up the colic arteries and to establish their vascular territories (Figure 1 – a, b, c, d, e, f, g, h).

Results and discussions

The study may be divided into three distinct chapters, in order referring to: colic branches of the superior mesenteric artery, colic branches of the inferior mesenteric artery and the vascular colic territories.

Colic branches of the superior mesenteric artery

The right superior colic artery is found in 98% of the cases (Figure 2).

It may have a direct origin (55%) or through a common trunk (45%) with right middle colic artery (33%), with transverse colon artery (8%) or with right middle colic artery and with transverse colon artery (4%). This artery can be sometimes precocious divided in two (8%).

We mention an interesting case when right superior colic artery came from inferior mesenteric artery. This phenomenon can be explained through a great extension of the posterior embryonic intestine to the prejudice of anterior one.

The right middle colic artery is present in 88% of the cases (Figure 3).

This one has a direct origin (52%) or through a common trunk (48%) with right superior colic artery (36%), with right inferior colic artery (7%) or with right

superior colic artery and transverse colon artery (4%). This artery rarely is going to divide in two (5%).

The right inferior colic artery (100%) is always present and has a direct origin (94%) or through a common trunk with right middle colic artery (6%). This artery is also known as ileo-colo-bicaeco-appendicular artery, named after the territories irrigated (Figure 4).

The transverse colon artery (middle colic) is an inconstant branch, being found in only 33% of the cases (Figure 5).

It can have direct origin (56%) or through a common trunk (44%) with right superior colic artery (22%) or with right superior colic artery and right middle colic artery (22%). This artery can be precocious divided in two (6%).

The presence of the transverse colon artery, normal one or precocious divided, or its absence, allow us to divide Riolan's arch in: simple (64%), when the transverse colon artery is absent; double (34%), when the previous one is present; triple (2%), when it is precocious divided in two (Figure 6).

Colic branches of the inferior mesenteric artery

The left superior colic artery is present in 100%. This artery has a direct origin (58%) or through a common trunk with left middle colic artery (42%). It can be precocious divided in two (24%). We mention that in only one case the left superior colic artery came from superior mesenteric artery.

The development of middle embryonic intestine may be a causal explanation for the origin of superior left colic artery from the superior mesenteric artery (Figure 7).

The left middle colic artery was found on half of the researched cases (50%). It may have a direct origin (12%) or through a common trunk (88%) with left superior colic artery (84%) or with left inferior colic artery (4%). The middle left colic artery can appear precocious divided in two in 10% of the cases (Figure 8).

The left inferior colic artery is present in all the cases (100%) and has a direct origin (96%) or through a common trunk with middle left colic artery (Figure 9).

This artery, called also trunk of the sigmoid arteries is going to divide immediately in 2 (26%), in 3 (68%) and rarely in 4, 5 or 6 branches (6%).

Vascular colic territories

In 98% of the cases, the territory of superior mesenteric artery occupies the caecum, the ascendant colon and the two right thirds of transverse colon and the inferior mesenteric artery irrigates the left third of transverse colon, the descendant colon and the sigmoid colon.

In 2% of the cases these territories are different. In one case the inferior mesenteric artery extends its territory to the right angle of the colon and in other case the territory of the superior mesenteric artery extends till the incipient part of the descendant colon (Figures 10–12).

The territory of inferior right colic artery includes caecum and the inferior half of ascendant colon, while the territory of superior right colic artery includes the superior half of ascendant colon and two right thirds of transverse colon.

The existence of the middle right colic artery goes to a superposition of a little territory into the middle part of the ascendant colon, between the superior and inferior right colic territories.

Through the coming out of the middle colic artery in the middle part of the transverse colon appears a new vascular territory (Figures 13 and 14).

The territory of the left superior colic artery includes the left third of transverse colon and the descendant colon, and left inferior colic artery irrigates the sigmoid colon.

The existence of left middle colic artery goes to the appearance of a little territory between superior and inferior left artery, witch includes the terminal part of descendant colon and the incipient part of the sigmoid colon.

Conclusions

The colon has two important vascular territories, one from the superior mesenteric artery and the other one from inferior mesenteric artery, the limit between them being situated where the two right thirds meet the left third of the transverse colon.

The territory of superior mesenteric artery may includes two, three or even four territories dependent on right inferior colic artery, right superior colic artery, right middle colic artery and middle colic artery.

The territory of the mesenteric artery is served by left superior colic artery, left inferior colic artery and sometimes by the left middle colic artery.

The colon presets four constant vascular territories to witch, in most of the cases is added a fifth territory (88%), sometimes a sixth in 50% of the cases and even a seventh territory in 36% of the cases.

Each colic branch has a precise territory; the existent anastomosis did not function all the time.

Knowing the colic vascular territories of the mesenteric arteries has a special interest in surgical practice because of the difficult postoperatory revitalization of the colon.

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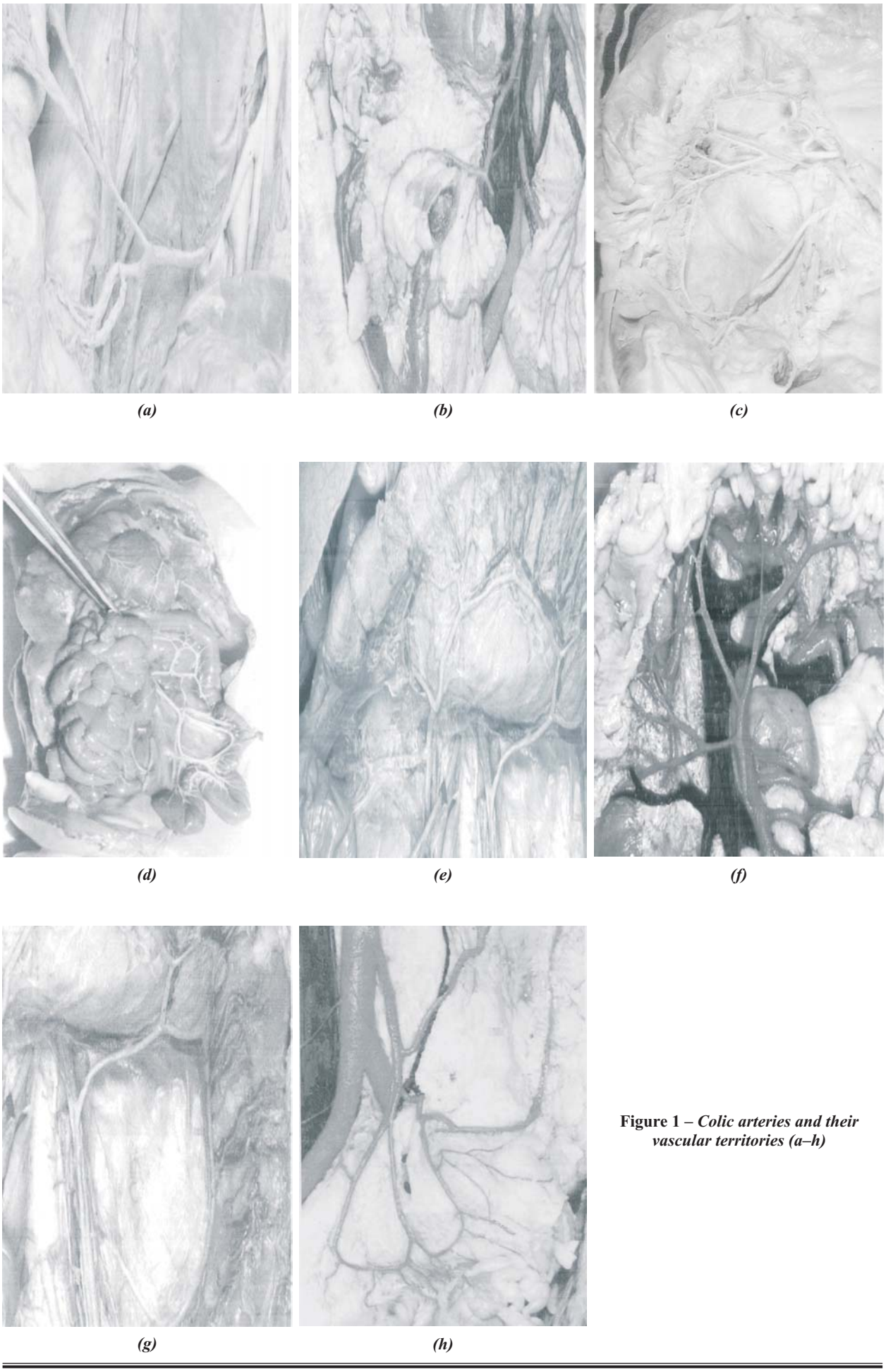


(a) *(b)* *(c)*

(d) *(e)* *(f)*

(g) *(h)*

Figure 1 – ***Colic arteries and their vascular territories (a–h)***

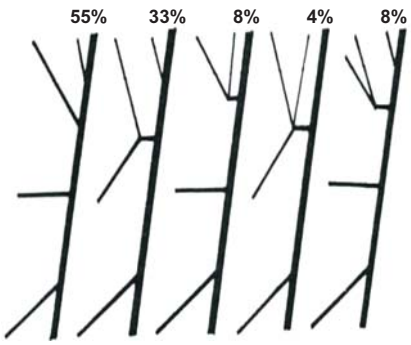


Figure 2 – ***Superior right colic artery***

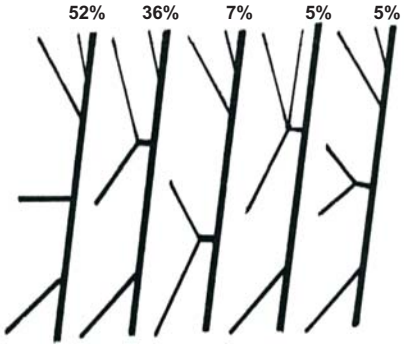
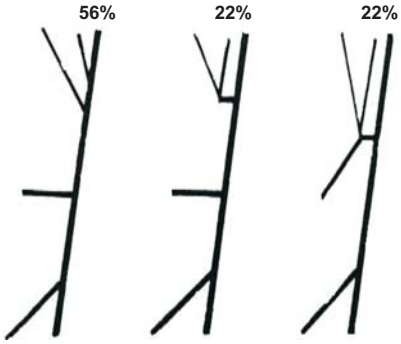


Figure 3 – ***Middle right colic artery***

Figure 4 – ***Inferior right colic artery***

Figure 5 – ***Transverse colic artery***



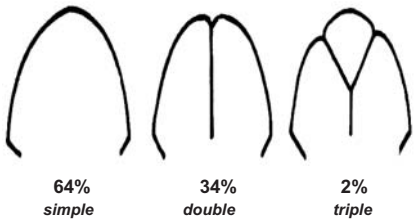


Figure 6 – ***Variants of the Riolan's arch***

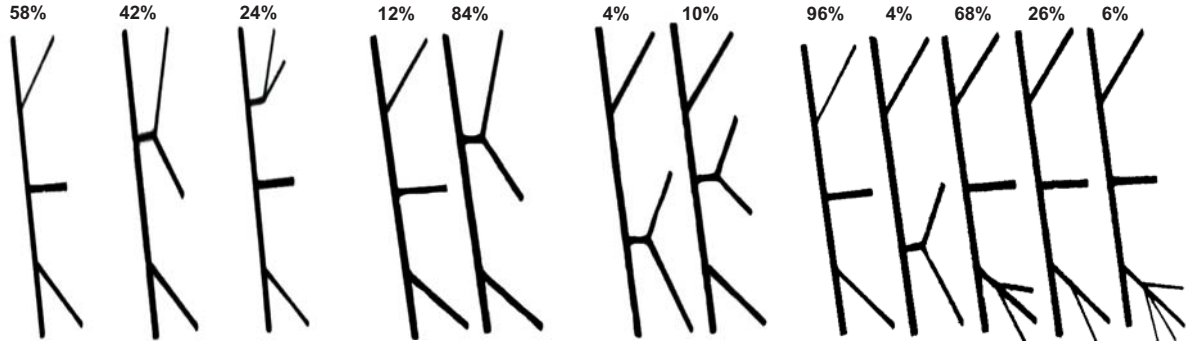


Figure 7 – ***Superior left colic artery***

Figure 8 – ***Middle left colic artery***

Figure 9 – ***Inferior left colic artery***

Figure 10 – ***Vascular territories of the superior and the inferior mesenteric arteries***

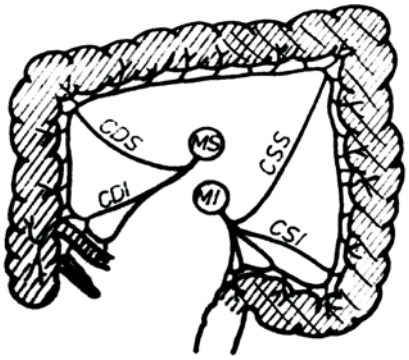


Figure 11 – ***Extension of the inferior mesenteric territory***

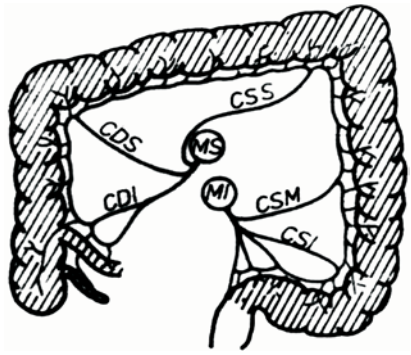


Figure 12 – ***Extension of the superior mesenteric territory***

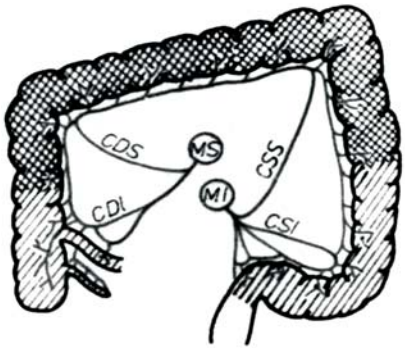


Figure 13 – ***Vascular territories of the colon***

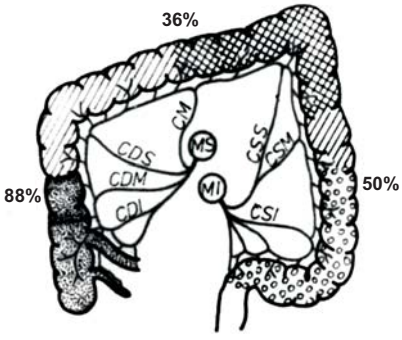


Figure 14 – ***Vascular territories of the colon***

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Mailing address

Marius Corneliu Niculescu, Assistant Professor, M. D., Ph. D., Department of Anatomy and Embryology, "Victor Babeş" University of Medicine and Pharmacy, Square Eftimie Murgu no. 2, 300 041 Timişoara, Romania; Phone / Fax +40256–220 479, E-mail: niculescu@umft.ro

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