

## Variations in Branching Pattern of Superior Mesenteric Artery- A Cadaveric Study

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### Abstract:

**Objective:**The aim of this study was to detect and describe the existence and incidence of anatomical variations of the superior mesenteric artery by using dissection method.**Materials and methods:** 40 cadavers dissected, anatomy department of S.M.S.Medical college jaipur. **Results:** we found that 77.50% of patients presented a classic anatomy of the superior mesenteric artery, using dissection (cadaveric) method, we found the existence of variations of these abdominal blood vessels in 27.50% of cadavers.

**Conclusion:** preoperative knowledge of such variations on the part of surgical team is exceedingly important to avoid iatrogenic arterial injury, predominantly in light of the increasing number of laproscopic interventions.

**Keywords:** variations, coeliac trunk , inferior vena cava.

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### I. Introduction

The superior mesenteric artery arise from ventral aspect 1cm below the coeliac trunk at the level of 11/12 vertebra, it run antero-inferiorly within the root of mesentery. Its course slightly downwards and right crosses the inferior vena cava (ivc), right psoas, right ureter from anterior aspects, it divides in to jejunal and ileal branches from its left side and inferior pancreatico-duodenal, right colic, middle colic, ileocolic arteries on right side.<sup>[1]</sup> superior mesenteric artery is the 13<sup>th</sup> segmental artery which develops for midgut. It supplies all the derivatives of midgut, namely second part of duodenum below the opening of bile duct, jejunum, ileum, appendix, caecum, ascending colon, right two-third of transverse colon and lower half of head of pancreas.<sup>[2]</sup> Past research on cadavers does not show so much variations. About 15% of the population displays significant variations from the typical branching pattern.

Prior knowledge about the anomalous branching pattern of celiac trunk and superior mesenteric artery is essential to successfully accomplish surgical, oncologic or interventional procedures including lymphadenectomy around a hepato-spleno-mesenteric trunk, aortic replacement with reimplantation of trunk all of which can potentially create significant morbidity because of the large aart of gut supplied by artery.<sup>[3]</sup>

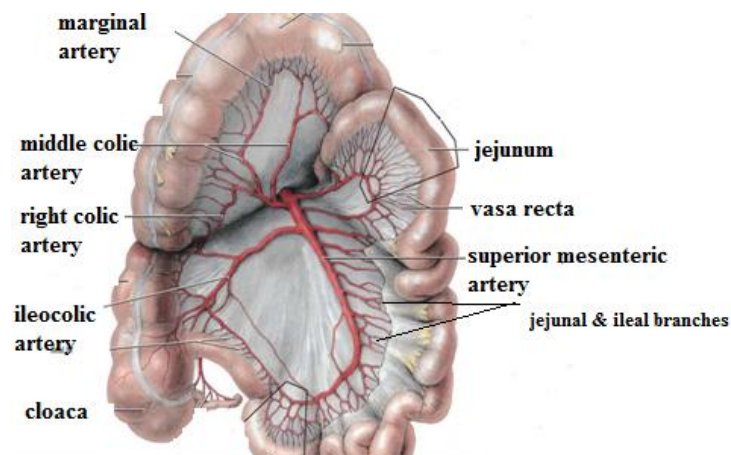


Figure 1.1: Normal Branching Pattern of Superior Mesenteric Artery.

## II. Materials And Methods

The present study was conducted on forty cadavers with age ranging between 20 to 60 years in the department of anatomy, S.M.S. Medical college jaipur. The dissection was conducted as per Cunningham's manual of practical anatomy.

### Instruments Used Were-

- Scissors (Pointed, Blunt, Curved, 4" And 6" Size)
- Scalpel (Blade No. 23)
- Forceps (Plane And Tooth)
- Thread
- Divider
- Measuring Scale Etc.

## III. Results

Study conducted on total 40 cadavers, it is found that 2 cadavers I.E. 5%, were having common coeliac mesenteric trunk (fig.1.3), 5 patients I.E. 12.5% right colic and middle colic arise from common trunk (fig.1.4), and presence of accessory right colic artery in 4 patients I.E. 10% (fig.1.5). We found that 77.50% of patients presented a classic anatomy of the superior mesenteric artery (fig.1.2), the superior mesenteric artery arises from the ventral side of the abdominal aorta, at the level of the 11/12 vertebra and then divides into jejunal and ileal branches from its left side and inferior pancreaticoduodenal, right colic, middle colic, ileocolic arteries on right side.<sup>[1]</sup> using this dissection method, we found the existence of variations of these abdominal vessels 27.50% of cadavers. Incidence of variations according to sex shown in table No 1.

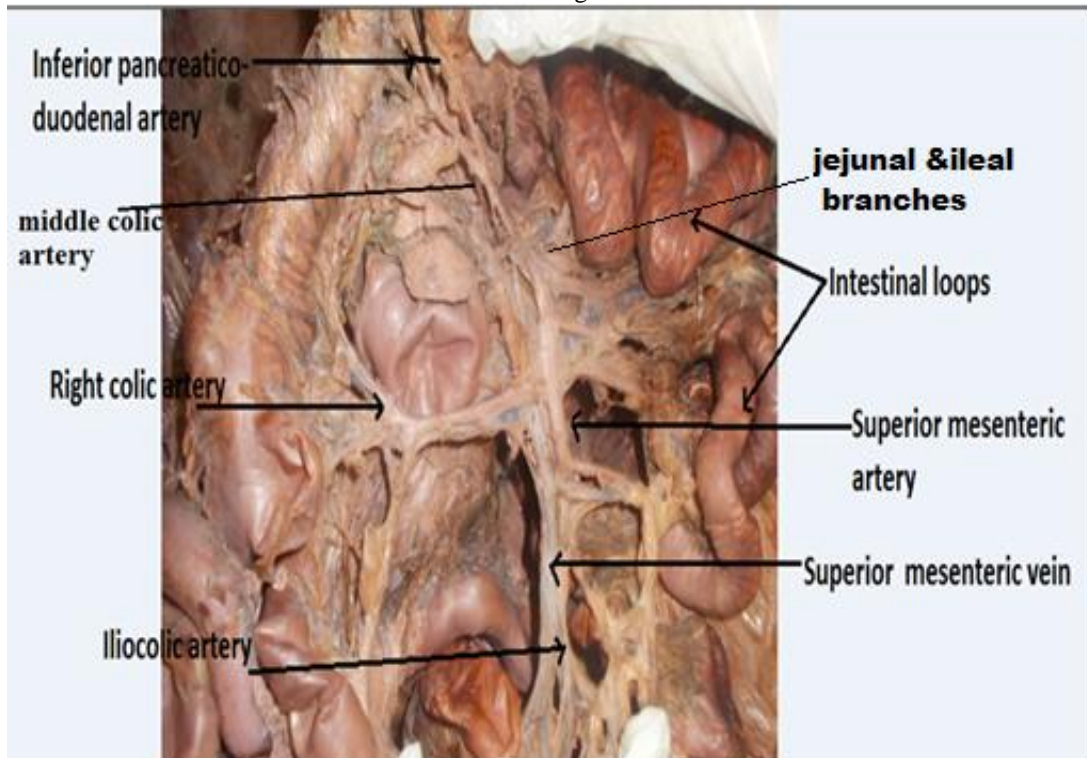


Figure 1.2-Type I Normal Branching Pattern of Superior Mesenteric Artery

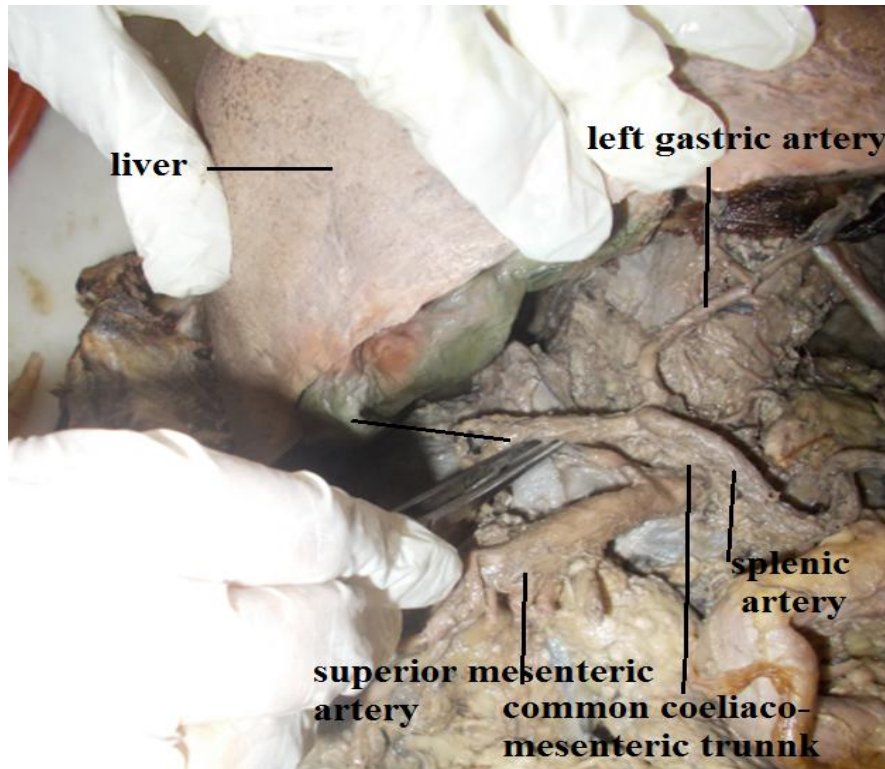


Figure 1.3-Type II Common Coeliaco-Mesenteric Trunk

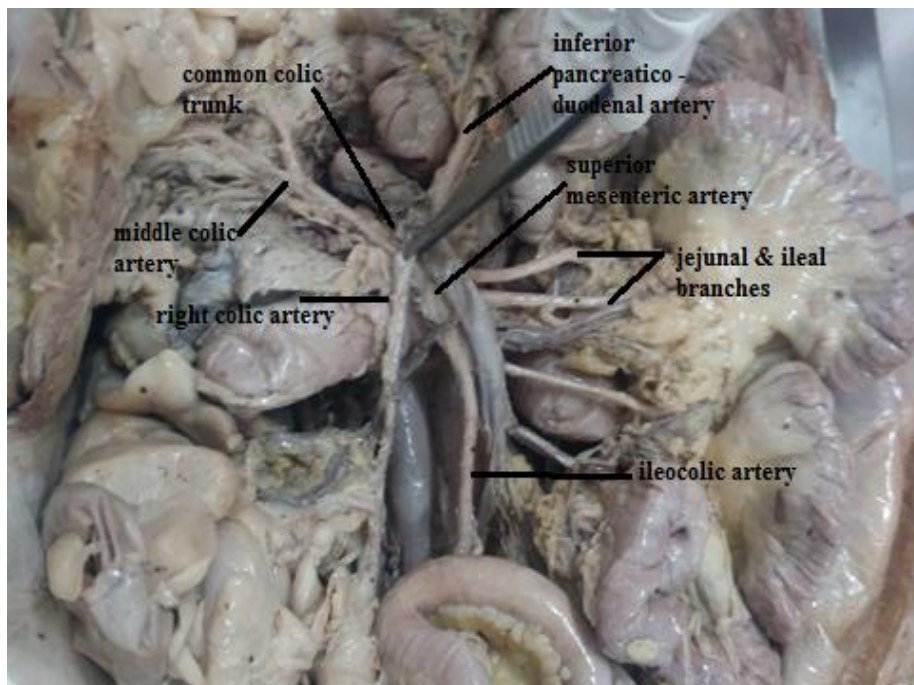


Figure 1.4-Type III Common Colic Trunk



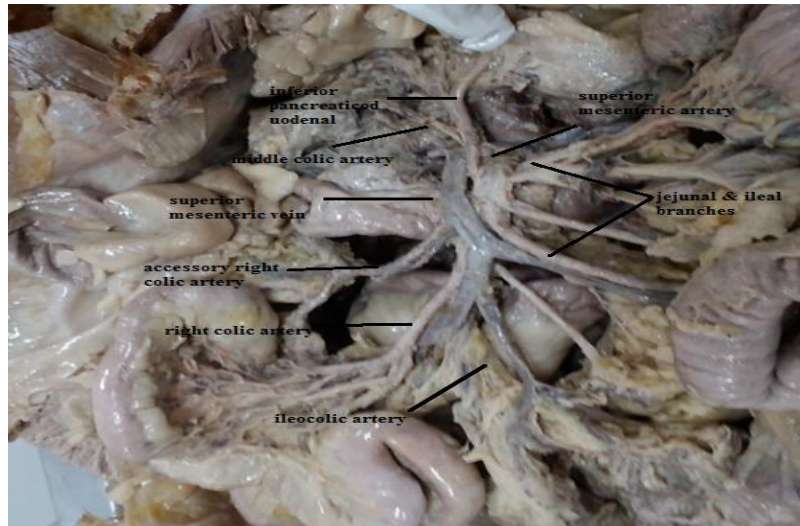
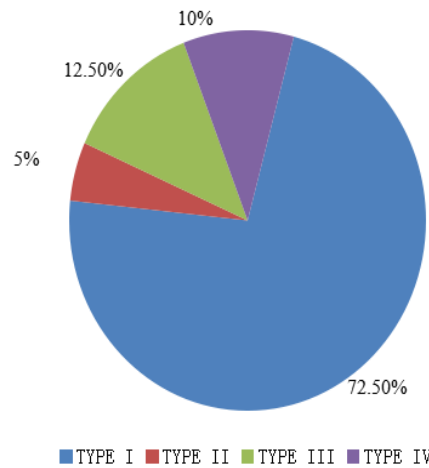


Figure 1.5-Typeiv Presence of Accessory Right Colic Artery

Table 1: Branching Pattern Of Superior Mesenteric Artery In Males And Females .

BRANCHING PATTERN	MALE		FEMALE		TOTAL	
	No	%	No	%	No	%
Type I	21	70.00	8	80.00	29	72.50
Type II	2	6.67	0	0.00	2	5.00
Type III	3	10.00	2	20.00	5	12.50
Type IV	2	6.67	2	0.00	4	10.00
Total	30	100	10	100	40	100

Branching pattern of superior mesenteric artery (cadaveric study)



#### IV. Discussion

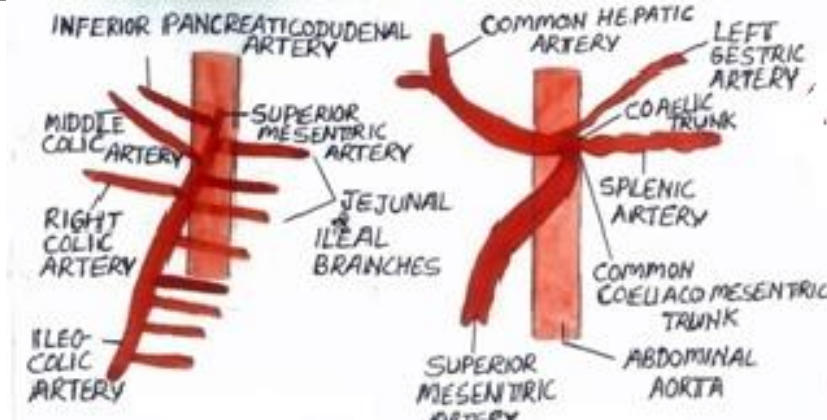
Vascular anatomical variations of the coeliac trunk and the superior mesenteric artery were described by Tandler in 1904, as the result of disorders during embryogenesis. During human embryogenesis, four roots of the omphalo-mesenteric artery, as the anterior branches of the abdominal aorta, are connected by the ventral longitudinal anastomosis. The central two of these four roots disappear during embryogenesis and the ventral anastomosis connects the first and the fourth roots.

Weber et al. reported the complete absence of branches from the superior mesenteric artery, absence of 3rd and 4th part of duodenum and proximal jejunum with apple peel configuration of the rest of the small bowel and an annular pancreas.<sup>[4]</sup> that type of variation not found in present study. "a special form of absence of the celiac trunk is the celiaco-mesenteric trunk where all three main branches of celiac trunk and superior mesenteric artery arise from the common trunk 2%."<sup>[5]</sup> similarly in Present Study It Was 2%. Cavadar et al Study Reported A Case Of Coeliaco Mesenteric Trunk A Variation Found In Only 1%.<sup>[6]</sup>

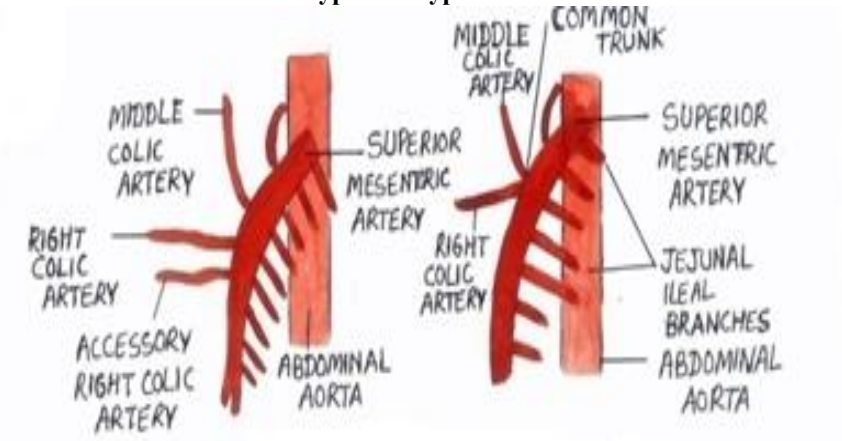
Bergman et al<sup>[7]</sup> reported that the right colic artery arises along with middle colic artery as a common stem", that type of variation also found in present study. Sonneland J Et Al reported that out of 600 bodies, in 78 % right colic artery arose as a single vessel, in 8.7 % showed two right colic arteries and in 0.7 % three right colic arteries arising from superior mesenteric arteries.<sup>[8]</sup> in present study presence of accessory colic arteries was 4%.

According to present study branching pattern of superior mesenteric artery divides in to following types:-

#### Diagrammatic Representation Of Branching Pattern Of Superior Mesenteric Artery



#### Type I & Type II



#### Type III & Type IV

All these variations have embryological origin. During development, each primitive dorsal aorta gives off splanchnic arteries which divides in to somatic, ventral and lateral groups. As the embryo continues to develop, most of the segmental arteries degenerate, except for the precursors of the segmental arteries to the three major mesenteric vessels in abdominal region.

Anatomic variations of the coeliac trunk are due to developmental changes in the ventral segmental (splanchnic) arteries. Presence of additional arteries may provide collateral circulation which may be important during transplant surgeries.<sup>[9]</sup>

#### V. Conclusion

To conclude, the superior mesenteric artery which is the artery of the midgut is known for its variation. A detailed knowledge about the normal pattern and anomalous pattern of superior mesenteric artery and its branches are helpful for correct exposition of any invasive procedures and resection of colon for intestine transfers, carcinoma, , resections of small and large intestines and embolectomy and appendicectomy .

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Event if I had been a scholar of all the languages in the world. It would not have been possible for me to pen down my deep respect and gratitude for my esteemed teacher and learned guide Dr.Dhiraj Saxena (professor) department of anatomy SMSMedical College and Hospital Jaipur .

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