



Evaluation of the course of the inferior mesenteric vein in laparoscopic colectomy for left sided colon cancer.

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Introduction

- Laparoscopic left sided complete mesocolic excision (CME) via medial to lateral approach involves the dissection of inferior mesenteric vein (IMV) following the dissection of inferior mesenteric artery (IMA). [1]
- In cases where IMV courses away from IMA in the vicinity of colic margin, the dissection of IMV may injure the marginal blood vessels and result in anastomotic ischemia and leakage.
- The length of left colic artery (LCA) branch off is important to preserve LCA or to dissect around the IMA for lymph node dissection.[2]
- Preoperative 3D-CT angiography is a useful noninvasive modality to evaluate the vascular anatomical variations.[3]

Purpose

The aim of this study was to measure the distances of IMV from the root of the IMA, and to investigate the drainage patterns of IMV using preoperative 3D-CT angiogram for left-sided colorectal cancer using 3D-CT angiogram.

Methods and Materials

- We retrospectively analyzed 167 patients having left sided colon and rectal cancer and underwent left sided colon surgery between July 2014 and December 2019.
- 3D-CT angiogram was used to study the vascular patterns.
- Patients were divided into three groups based on the distance of IMV from the origin of IMA (D): Group I (<30 mm), Group II (30-59 mm), and Group III (60 mm or more).
- The drainage pattern of IMV was 3 types; Drainage to superior mesenteric vein (SMV) and splenic vein (SV) confluence, Drainage to SMV, and Drainage to SV.
- Likewise, the branching pattern of LCA from IMA was also evaluated. Type I: single LCA branched off from IMA; Type II: common trunk of LCA and sigmoid artery (SA); Type III: LCA, SA and SRA branched off from same point of IMA.
- We also calculated distance of LCA origin from root of IMA (d).

Results

- Sixty-two patients, 35 males and 27 females, were included.
 - There were no intraoperative complications, whereas postoperative complications occurred in 8 (12.9%) patients; namely, ileus in 5 cases, chylous ascites in 2 cases and anastomotic leakage in 1 case.
 - Two of the complications were Clavien-Dindo grade III, and 6 were grade II.
- Distance between IMV and origin of IMA (D) [Fig.1]:**
- D was less than 30 mm in 48 patients, 31-59 mm in 12 patients and 60 mm or more in 2 patients.
 - Mean D was 24 mm (range: 3.5 – 85 mm). Table 1 shows the patient data.

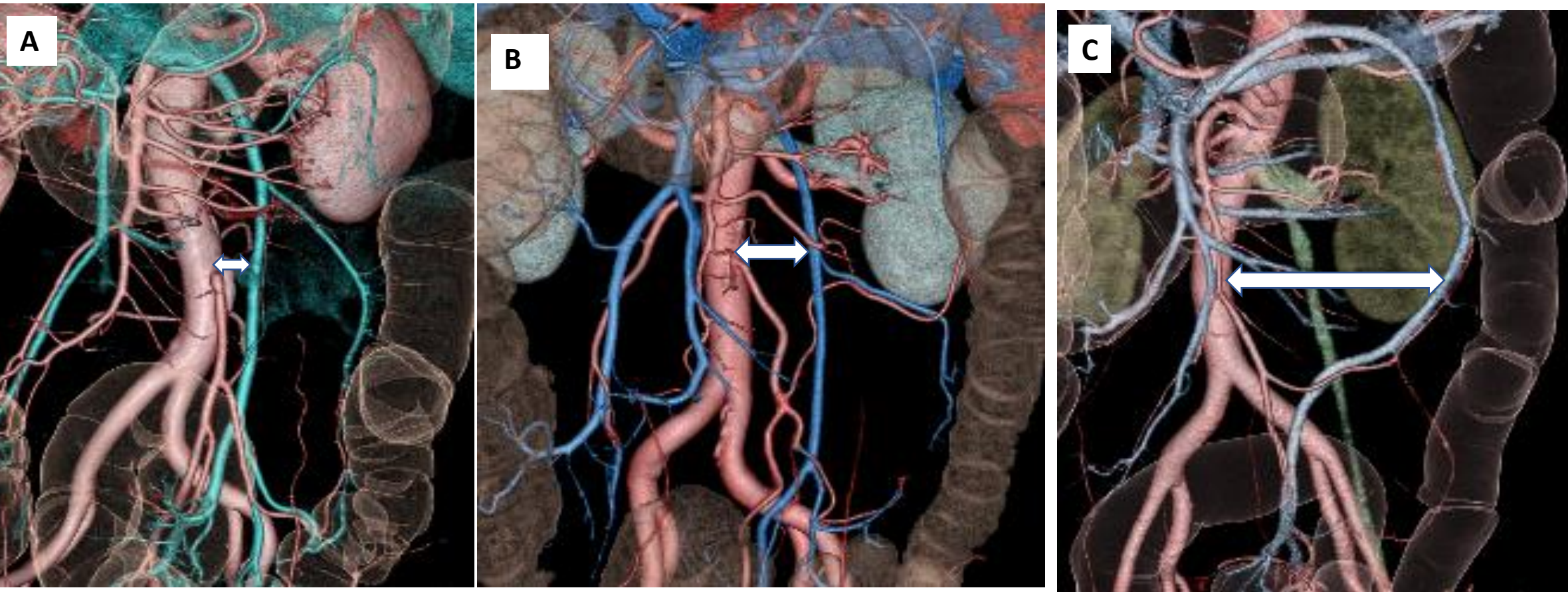


Fig. 1: The distance between origin of IMA and IMV: A. Group I- less than 30 mm; B. Group II- 31- 59 mm; C. Group III- 60 mm or more.

Table 1. Groups based on D; Patient demographics and surgical outcomes

Factors	Group I (48)	Group II (12)	Group III (2)	p-value
Age, median (Range)	67(26-87)	74(61-79)	644(58-70)	0.262
BMI, kg/m2, (mean ± SD)	22.6±3.1	23.1±2.3	27±14.1	0.952
Gender (M:F)	27:21	8:4	0:2	0.251
Operation time, min, (mean ± SD)	351.4±160.4	368.4±151.2	348.5 ±75.7	0.800
Intraoperative blood loss, ml, (mean ± SD)	146.8±661	55±80	20±14.1	0.876
Postoperative complications (%)	5 (10.4%)	2 (16.7%)	1(50%)	0.189
Postoperative hospital stays, median (Range)	13(9-48)	14.5(10-31)	14(12-19)	0.155
Distance till LCA branching off (d), (mean ± SD)	39.4±10.2	40.7±6.2	60.8±28.1	0.428

- No significant difference was found in operation time, bleeding, postoperative complications, postoperative hospital stay.
- Proportion of postoperative complication was higher in Group III (Group I- 10.4%, Group II- 18.2%, and Group III- 28.6 %: p value= 0.188).
- The IMV in Group III was very near to colonic margin, and it was the marginal vein for left colon [Fig 1C.].

Drainage pattern of IMV [Fig. 2]:

- Twenty patients in confluence drainage pattern, 13 in SMV drainage pattern and 29 in SV drainage pattern were observed. Table 2 shows patient data and surgical outcomes.
- No significant differences in postoperative parameters among the groups.
- The drainage patterns were not related to the distance of IMV from root of IMA.

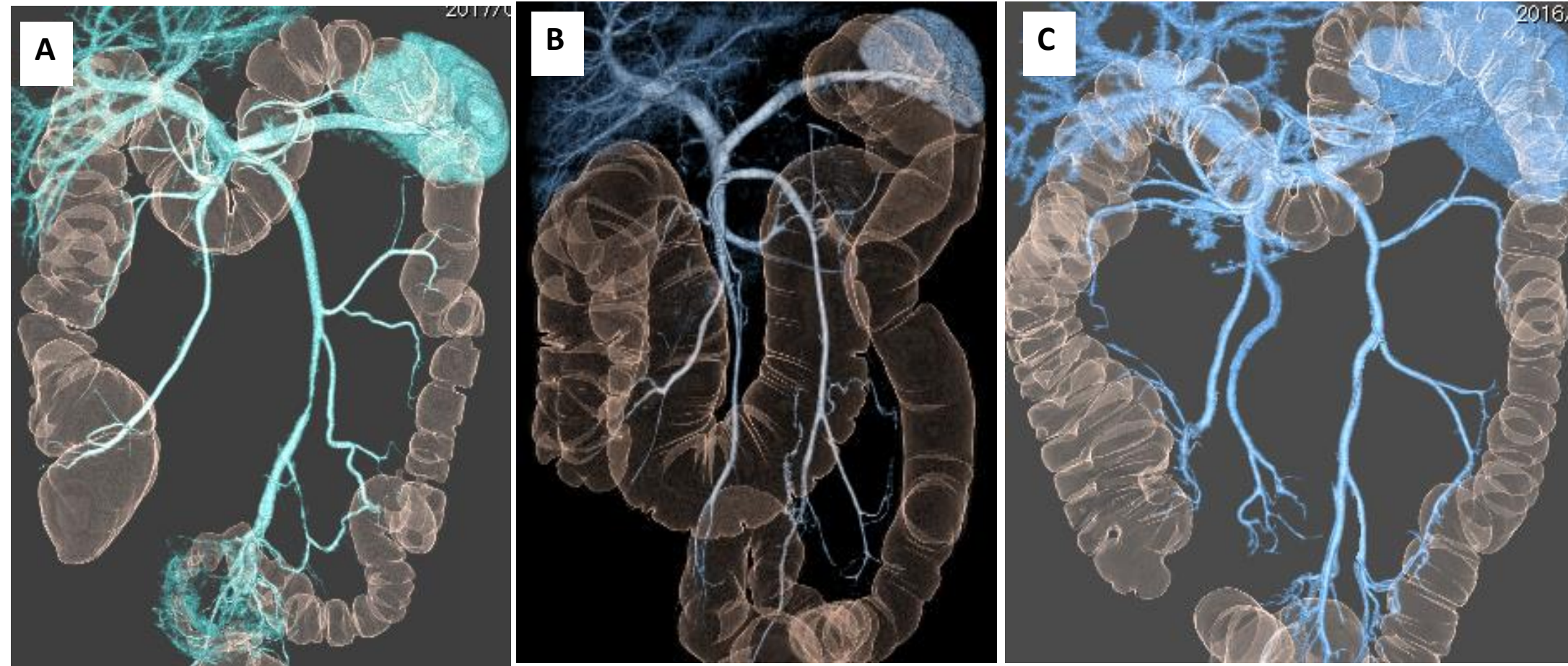


Fig. 2: The pattern of IMV drainage; A. Drainage to superior mesenteric vein (SMV) and splenic vein (SV) confluence; B. Drainage to SMV; C. Drainage to SV.

Table 2. IMV drainage pattern; Patient demographics and surgical outcomes

Factors	Confluence pattern (20)	SMV pattern (13)	SV pattern (29)	p-value
Age, median (Range)	61.8(26-79)	74(50-87)	69(37-83)	0.093
BMI, kg/m2 (mean ± SD)	22.8±2.9	23.2±5.3	22.7±3	0.978
Gender (M:F)	12:8	4:9	19:10	0.104
Postoperative complication	3	3	2	0.302
Operation time, min (mean ± SD)	350.8±136.2	403.5±218.4	335.3±133.8	0.417
Intraoperative bleeding, ml (mean ± SD)	68±112.9	390.8±1263.8	45±68.4	0.553
Postoperative hospital stays, median (Range)	12.5(9-21)	13(9-25)	13(10-48)	0.684
LCA origin distance, (mean ± SD)	44±13.9	38.3±7.3	38.8±8.9	0.510
D, (mean ± SD)	25.5±1.4	23.7±2	23.1±9.5	1.00

LCA branching pattern [Fig 3]:

- Table 3 shows patient data and surgical outcomes. The average shortest distance of LCA branch off (d) was 41.3±9.8 mm (14.7 mm to 80.6 mm).
- In 41 patients, single LCA branched off from IMA, there was a common trunk of LCA and SCA in 8 patients, and LCA, SCA and SRA branched off from same point in 13 patients.
- Among the 3 LCA branching patterns, the intraoperative bleeding was significantly higher in Pattern 1 (p value=0.035).
- Surgery time, postoperative hospital stay was higher in Pattern 3 but not statistically significant.
- The three branching patterns were not statistically related to the distance between origin of IMA and IMV.

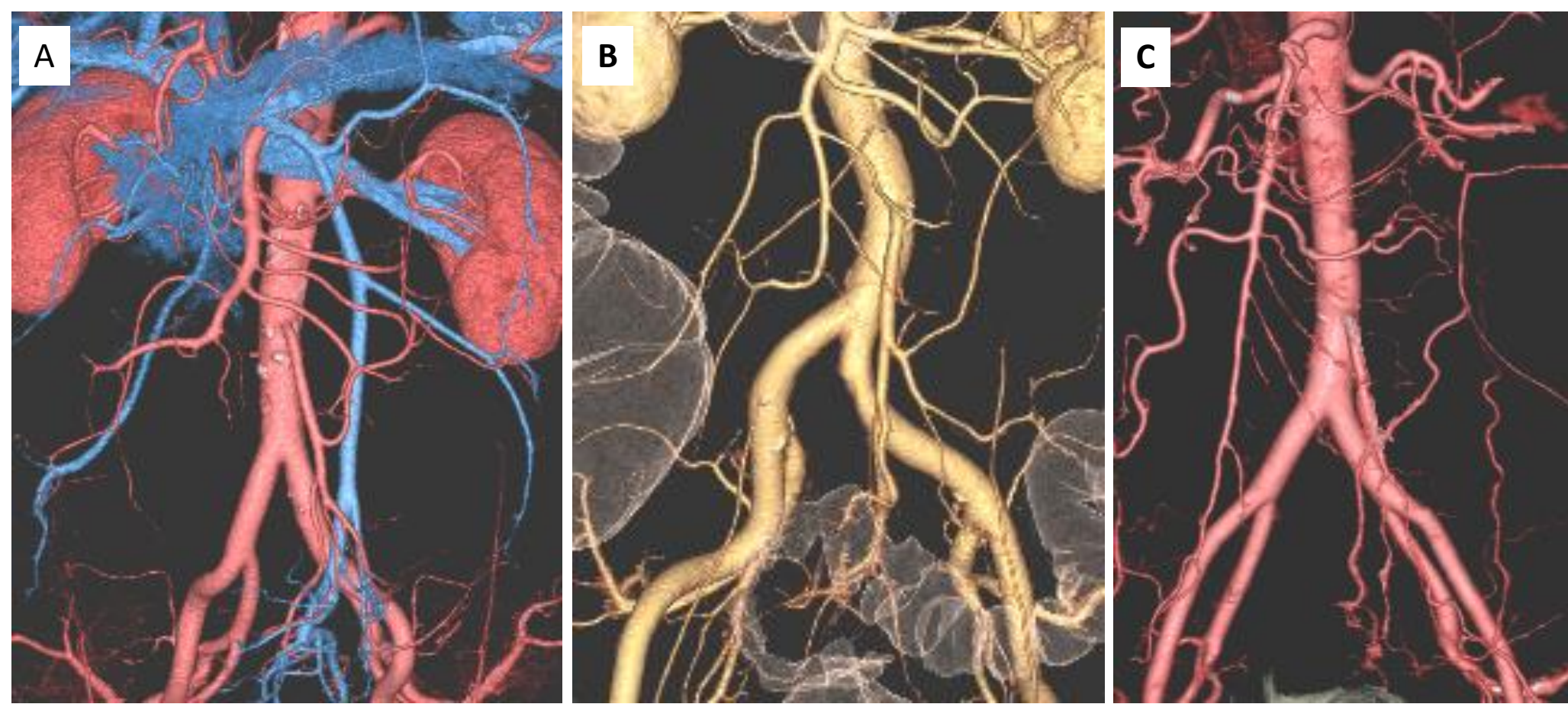


Fig.3: LCA branching pattern; 1. single LCA branch off from IMA; 2. LCA and SCA have a common trunk; 3. LCA, SCA and SRA branch off from a same point.

Table 3. LCA branching pattern; Patient demographics and surgical outcomes

Factors	Pattern 1 (41)	Pattern 2 (8)	Pattern 3 (13)	p-value
Age, median (Range)	68(37-87)	71(26-78)	67(37-76)	0.887
BMI, kg/m ² (mean ± SD)	22.9±3.8	21.9±3.1	23.3±2.5	0.656
Gender (M:F)	23:18	4:4	8:5	0.931
Postoperative complications	5	0	3	0.319
Operation time, min (mean ± SD)	348.5±175.4	338.5±80.3	383.7±122.1	0.366
Intraoperative bleeding, ml (mean ± SD)	143.3±714.3	26.9±28.7	127.3±130	0.035
Postoperative hospital stays, median (Range)	13(9-25)	12(9-15)	15(10-48)	0.077
Distance till LCA branch off	38.2±8.8	49.5±14	41.7±11.5	0.030

Discussion

- Proportion of complications, and length of LCA origin is more in cases with D 60 mm or more, although it could not be statistically justified.
- The IMV in Group III acted as the marginal vein for left colon (Fig. 1C). IMV ligation in these cases should be avoided to prevent anastomotic ischemia.
- Length of LCA origin is important in ‘low-tie’ procedures while dissecting lymph nodes around IMA.
- Similar results about LCA branching patterns have been reported. [4]
- The 3D CT angiography allows excellent visualization of mesenteric vessels and its collaterals and helps in preoperative laparoscopic procedure planning.
- It is required to be preoperatively acquainted with the anatomical vascular variations to perform a safe laparoscopic surgery. [5]
- Limitations: Inherent limitations of retrospective study, small patient number.

Conclusions

3D- CT angiography is extremely useful to understand the anatomical vascular variations before laparoscopic left-sided colon surgery.

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