Review

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Superior mesenteric artery syndrome following colorectal surgery: a systematic review

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Background: Superior mesenteric artery syndrome (SMAS) is a rare characterized by obstruction of the third portion of the duodenum due to compression of this region between the superior mesenteric artery (SMA) and aorta. Diagnosis of SMAS post-surgical procedures is challenging due to nonspecific symptoms.
Methods: In accordance with the Preferred Reported Items for Systematic Reviews and Meta-Analysis guidelines, five electronic databases were systematically searched of all case reports published on SMAS diagnosed after colorectal procedures up to October 2023. The primary search of the databases revealed a total of 70 published articles. Thirty-eight studies were included.
Aim: to discuss the prevalence of SMAS post-colorectal surgery, possible causes, preventive measures and best management options.
Results: Total proctocolectomy with ileal J-pouch anal anastomosis was the most commonly reported surgical procedure (41.6%) preceding the diagnosis. Onset of symptoms since the primary operation had a wide range 1 day to >10 years. With a significant relation (P = 0.017) between duration of conservative treatment (>2 weeks) and its success.
Limitations: Our study was limited by a small sample size, the retrospective nature of data collection, variability in patient populations, surgical techniques, and postoperative care protocols across the included studies, and short follow-up periods.
Discussion: Majority of patient with SMAS following a colorectal surgery had successful conservative management (62.9%) within the time frame of 2–4 weeks (78.5%), while most reported patients with more extended conservative period eventually resorted to surgical management.
Conclusion: While conservative management is usually effective, surgical intervention should always be considered if there is no improvement within 4 weeks. Future research should focus on larger prospective studies to validate these findings and explore additional predictors of treatment success.

Keywords: colectomy, duodenal obstruction, ileoanal pouch, superior mesenteric artery syndrome, Wilkie's syndrome

Introduction

Superior mesenteric artery syndrome (SMAS) is a rare benign disease which has been described before with a variety of other names, including Cast syndrome, Wilkie syndrome, arteriomesenteric duodenal obstruction, and chronic duodenal ileus[1]. Characterized by extrinsic compression of the third portion of the duodenum between the superior mesenteric artery

HIGHLIGHTS

- Superior mesenteric artery syndrome is rare and it is very challenging to be detected in post-surgical procedure due to its nonspecific symptom.
- Through our literature We have found that total proctocolectomy with leal J-pouch anal anastomosis was the most commonly reported surgical procedure (41.6%) preceding the diagnosis in comparison to other colorectal surgery.
- The purpose of this report is to discuss wither conservative management or early surgical management have better treatment chance in light of our literature.
- We believe that the early detection of SMAS and initial aggressive conservative management can work, and results vary widely, those requiring more extended conservative treatment eventually resorted to surgical management.
- Additional research with larger sample sizes and additional variables is needed to define patient management strategies and more standardized treatment plans.

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(SMA) and abdominal aorta with aortomesantric angle less than 25°[1-16], with estimated incidence in the general population 0.013%–0.78%[7,9,17,18]. This condition, first described by Von Rokitansky in 1861, is characterized by gastrointestinal symptoms, including bilious or non-bilious vomiting, abdominal pain, persistent nausea, and sudden significant weight loss. SMA syndrome after colectomy is extremely rare[3,10].

Colectomy surgery, commonly performed for colorectal cancer, inflammatory bowel disease, or other gastrointestinal conditions, induces profound changes in abdominal anatomy and physiology. Postoperative weight loss, loss of mesenteric fat, or altered positioning of the duodenum increases the risk of SMAS. As such, colectomy patients are at heightened risk of developing this rare complication. The connection between colectomy and SMAS is particularly relevant given the increased rates of colectomy in recent years[11]. Recognizing SMAS in the postoperative setting is crucial to prevent misdiagnosis and ensure timely management. The diagnosing SMAS is based on high index of suspicion and confirmed by imaging studies (contrast CT, fluoroscopy, and or MRI angiography)[1-4,6,9,15,19-22]. Diagnosing SMA syndrome symptoms are often nonspecific and can overlap with more common gastrointestinal conditions such as gastritis, gastroparesis, gastroesophageal reflux disease, and irritable bowel syndrome. Common clinical manifestations of SMA syndrome include early satiety, postprandial abdominal pain or discomfort, nausea, bilious vomiting typically following meals, bloating, belching, and reflux[1-4,6,9-13,19,20].

This systematic review aims to discuss the management of SMAS after colorectal surgery, exploring the potential methods to prevent its occurrence during the initial surgery. Given the complexity and rarity of SMAS, especially following colorectal procedures, this review seeks to consolidate current knowledge and provide recommendations based on available evidence.

Methodology

Screen and select studies

All study reporting SMA Syndrome after colonic surgery was included in adult and pediatric group, studies were excluded if SMA Syndrome occurred spontaneous, after or during receiving chemotherapy, not related to colorectal surgery, no full study or English abstract was available. The Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines were followed[14]. A comprehensive literature search was conducted using databases such as PubMed, EMBASE, Cochrane, Scopus, and Google Scholar. The search terms included "superior mesenteric artery syndrome," "colectomy," "ileoanal pouch," "duodenal obstruction," and "Wilkie's syndrome." The search was limited to studies published in English or those with English abstracts. The last review was conducted on 17 October 2023; any papers published after this date were not included.

Assessment of the quality and risk of bias

Research articles were independently assessed by three reviewers (NA, WY, and/or RA) using the QualSyst tool. This standardized, reproducible, and quantitative tool evaluates research quality across various study designs, including both quantitative and qualitative methodologies. It focuses on the internal validity of studies, emphasizing how well the design, execution, and analysis minimize errors and biases. Each study receives a score ranging from 0 to 1, with higher scores reflecting greater methodological rigor and lower risk of bias. Scores are categorized as follows: >0.8 (strong), 0.71–0.79 (good), 0.50–0.70 (adequate), and <0.50 (limited). While the QualSyst score informed the quality appraisal, it was not used to exclude studies from the review.

Across the studies assessed, 75% demonstrated methodological rigor rated as either "good" or "strong," with a median QualSyst score of 0.75 (range: 0.36–1.00; interquartile range: 0.14). Despite these ratings, evidence related to the clinical care of SMA in adults was generally poor. For studies focused on patient experience or patient-reported outcomes, selection bias was often high due to recruitment strategies (e.g., opt-in designs) or participant characteristics (e.g., underrepresentation of individuals with lower educational attainment). Information bias was moderate, primarily attributed to the use of non-validated survey instruments in several studies. Additionally, concerns about generalizability were notable.

Data extraction software

Data extraction was conducted by two reviewers and was verified by a third and fourth reviewers. Data were extracted under the broad categories of participant demographics, clinical details, treatment and surgery-related details and clinical outcomes reported. All reported outcomes were identified and recorded.

Data synthesis and analyses

Data were summarized in Table 1. Descriptive data were expressed using basic statistics including proportions and averages. Patients were divided into three groups based on the duration of conservative management (<2 weeks, 2–4 weeks, and >4 weeks). Cases with unknown results were removed. Differences between the two conservative management groups were analyzed using an independent samples t-test or Chi-Square Test. *P* values <0.05 were considered statistically significant. All data were analyzed using IBM SPSS Statistics software. Additionally, logistic regression analysis was performed to evaluate the impact of age, duration of conservative management, and timing of diagnosis on the success of conservative treatment.

Result

The primary search of the databases revealed a total of 70 published articles. The literature search strategy flowchart is shown in (Fig. 1). In total, 53 manuscripts were examined in full, of which 38 articles met our inclusion criteria. Table 2 shows the details of the included cases. There was a total of 34 cases with a mean age of 47.7 ± 23.9 years. The majority were male (55.5%).

Surgical procedures included total proctocolectomy with ileal J-pouch anal anastomosis (41.6%), subtotal colectomy (11.1%), left hemicolectomy (8.3%), extended left hemicolectomy (2.7%), left hemicolectomy and LAR (2.7%), right hemicolectomy (8.3%), LAR (5.5%), transverse colectomy (2.7%), small bowel resection (8.3%), intra-abdominal abscess drainage (2.7%), Deloyers procedure (2.7%), and cecopexy (2.7%). The majority of patients had a single colorectal operation (88.8%),

Table 1

Superior metric artery syndrome after colon surgery

Ref	Author/date	Age	Gender	Disease	Type of first surgery	Time of presentation after first surgery	Presenting symptoms	Diagnostic method	Treatment		Outcome
									Conservative	Surgical/type	
[20]	Garth H. Ballantyne/ 1987	23	Male	Left-sided ulcerative colitis	IPAA	POD 2	Nausea, burping, Abdominal distention, 2 L NGT aspirate	CT scan	Yes 2 weeks	No	Improved D/C 20 days from after first surgery
[19]	Mehmet Ali Yerdel/1992	70	Female	Multiple polyps in the transverse and left colon with synchronous descending and sigmoid colon carcinoma	Extended Left hemicolectomy + R3 LND + transversorectal anastomosis	POD 3	Nausea burping, vomiting, epigastric distention, increased NGT output.	UGI series on POD 10	Yes 32 days	No	Improved D/C 42 days after first surgery
[22]	Ricardo N/1995	43	Female	Ulcerative colitis	IPAA	POD 3	Vomiting, abdominal distention, no passage of gas through the ileostomy	UGI series	Yes 11 days Failed	Yes POD 11 Releasing duodenum retroperitoneal attachment (strong)	Good D/C 20 days after 1st surgery
[25]	Hideto Yariyama, M/2000	74	Male	Descending colon cancer	Left hemicolectomy	POD 9	Vomiting	Upper GI series + CT scan	Yes 2 weeks failed	Gastrojejunostomy	Improved -
[26]	A. Essadel/2001	26	Male	Ulcerative colitis	IPAA	POD 5	Prolonged gastric stasis	UGI series	Yes 7 days	Yes POD 12 Gastro-jejunostomy	Improved 8 days after 2nd surgery
[11]	Otsuka/2005	81	Female	Multiple carcinomas of the transverse colon and cecum	Extended right hemicolectomy PSHx: APR for rectal cancer in 1991	POD 2	Vomiting	Upper GI series + CT scan	No	Duodenal mobilization with division of Treitz's ligament (strong)	Improved 22 days after 2nd surgery
[9]	P. M. Christie/ 2005	21	Male	Refractory ulcerative colitis,	IPAA	POD 6	Vomiting, increase NGT aspirate	Barium study	Yes 6 weeks	Yes The ligament of Treitz was divided and the duodenojejunal flexure completely mobilized, then transposed to a position anterior to the superior mesenteric artery by dividing and re-anastomosing the bowel.	Improved 15 days after 2nd surgery
[10]	Claudio de Oliveira Matheus/ 2005	20	Female	FAP	IPAA	POD 3	Vomiting, abdominal pain and distention	CT scan	Yes 17 days	No	Improved 29 days after first surgery
[6]	Jason Boldery/ 2006	58	Male	Primary adenocarcinoma of the jejunum.	Small bowel resection (jejunum 40 cm + end to side anastomosis with distal duodenum)	POD 4	Large amounts of bile-stained fluid began draining through his nasogastric tube.	Gastrografin follow-through	Yes -	No	Improved

(*Continues*)

Table 1

(Continued).

Ref	Author/date	Age	Gender	Disease	Type of first surgery	Time of presentation after first surgery	Presenting symptoms	Diagnostic method	Treatment		Outcome
									Conservative	Surgical/type	
[27]	Sakai/2006	52	Female	Descending colon cancer	Left colectomy + D3 LND + + end-to-enda nastomosis	POD 9	Nausea and vomiting	US + 3D CT	Yes 28 days	-	Improved D/C on 49 POD
[21]	James B Haddow/ 2007	16	Female	FAP	IPAA	POD 10	Significant pain in her left iliac fossa and had voluminous bilious vomiting	CT On POD 16	Yes 6 days	Yes Day 16 Duodenojejunostomy	Improved 2 weeks after 2nd surgery
[28]	Masato Nawa/ 2007	45	Female	Cecal volvulus	Cecal fixation to retroperitoneum	PO 1 month	Vomiting and abdominal pain	3D-CT	Yes 2 months	Yes Side-to-side jejunostomy of the descending duodenum	Improved -
[25]	Okazaki/2008	80	Male	Descending colon and rectum	Left colectomy + LAR + D3 LND + transverse colo-rectal anastomosis	POD 11	Vomiting	CT and upper gastro-intestinal series	Yes 24 days	-	Improved
[12]	Ryousuke Hamano/ 2010	58	Male	Descending colon cancer	Left hemicolectomy + D3 LND + end-to-end anastomosis	POD10	Nausea and vomiting	Upper GI series + CT scan	Yes 26 days	No	Improved 29 days after first surgery
[4]	Truong/2013	29	Female	FAP	Laparoscopic-assisted TPC, IPAA, with diverting loop ileostomy.	POD 15	Nausea, vomiting, abdominal cramping, watery ileostomy output with weight loss	CT	Yes 2 weeks	No	Improved 4 weeks after read-mission for SAMS
[1]	N. M Fearon/ 2013	79	Male	Hepatic flexure tumor	Right hemicolectomy + ileostomy PSHx: 1st Open appendectomy 2nd open cholecystectomy 3rd Partial gastrectomy 4th Colonic resection with stoma 5th stoma reversal	POD 14	Nausea, vomiting, weight loss	CT	Yes	No	Improved
[24]	Paola de Angelis/2015	7	Male	Subtotal colonic Hirschsprung disease Celiac disease	Deloyers procedure	PO 3 years	Bilious vomit, post-prandial abdominal pain and diarrhea	US + Upper GI study + CT + endoscopy Duodenal biopsy	Yes 3 weeks	No	Improved D/C 3 weeks

(*Continues*)

Table 1

(Continued).

Ref	Author/date	Age	Gender	Disease	Type of first surgery	Time of presentation after first surgery	Presenting symptoms	Diagnostic method	Treatment		Outcome
									Conservative	Surgical/type	
[2]	Hiroaki Kitade/ 2015	74	Female	UC with descending colon cancer invaded to the tail of pancreas	Total colectomy with distal pancreatectomy	POD 17	Abdominal discomfort, vomiting	CT + Upper GI series	Yes 93 days	Side to side duodenojejunostomy 110-day post-op	Improved 38 days after 2nd surgery
[29]	Koichi Takiguchi/ 2015	59	Male	Transverse colon cancer	Partial colectomy (transverse colon)	POD 14	Vomiting, abdominal pain and distention	CT	Yes 14 days	-	Improved
[13]	Jaw Wen Chen/ 2016	44	Female	Clostridium difficile colitis	Subtotal colectomy + ileo-sigmoid anastomosis	PO 2 years	Abdominal pain, Nausea, vomiting, and chronic diarrhea	CT + Upper GI series	No Patient request	Roux en y duodenojejunostomy	Improved
[5]	Mohamed H/2017	23	Male	FAP	IPAA	POD 3	Abdominal pain, vomiting, no passage of gas or liquid through the ileostomy.	CT scan	NGT decompression	No	Improved
[16]	Hitesh Gupta/ 2019	20	Female	Abdominal TB with single ileal perforation	Resection of perforated bowel segment with proximal ileostomy and mucus fistula of distal ileum was performed	POD 10	Vomiting, abdominal pain, stoma output decreasing to less than 100 mL per day	CT	Yes 3 weeks on TPN	-	Improved
[18]	Sinan Albayati/ 2019	70	Female	Metachrono us left colon adenocarcinoma following a previous anterior resection for a sigmoid cancer thirteen years earlier.	Laparoscopic low anterior resection	POD 13	Abdominal pain. Vomiting, decreased oral intake	CT scan	Yes 4 weeks	No	Improved
[30]	Yoshinori Shimizu/ 2019	71	Male	Ascending colon cancer	Right hemicolectomy	POD 8	Vomiting	CT	Yes 34 days	No	Improved D/C on 41 POD 41
[3]	Xiangmin Li/ 2022	64	Male	Multiple colon polyposis and constipation	Laparoscopic subtotal colectomy with cecal rectal anastomosis	POD 7	Abdominal bloating and vomiting	Upper GI series + + CT + angiography	Yes 3 weeks		Died from complication
[8]	Avelyn EY Aw/ 2022	18	Male	Ulcerative colitis Autism TB	1st sub-total colectomy and ileostomy 2nd ileo-anal pouch formation and stoma closure	PO 1 year	Vomiting, diarrhea, abdominal pain	Upper GI contrast study CT scan	Yes	No	Improved

(*Continues*)

Table 1

(Continued).

Ref	Author/date	Age	Gender	Disease	Type of first surgery	Time of presentation after first surgery	Presenting symptoms	Diagnostic method	Treatment		Outcome
									Conservative	Surgical/type	
[31]	Ali Mohtashami/ 2022	88	Male	Appendicitis	Open Appendectomy	PO 20 years	Anorexia and unintentional weight loss of 15 kg	CT + EGD	No	Exploratory laparotomy and gastro-jejunal bypass.	Improved
[23]	Juan Xie/2023	29-64	4 males	5 patients had ascending colon cancer	Laparoscopic right hemicolectomy + ilo-anal anastomosis	POD 5–10	Epigastric distention, vomiting	3 patients enhanced CT + upper gastro intestinal series.	Yes 4 patient	Yes 2 patients out of 6 duodenojejunostomy / gastrojejunostomy	Improved
			2 females	1 patient had ascending colon lymphoma.				3 patients CT only.			
[32]	Sanketh Edem/ 2023	36	Female	Pulmonary TB on medications + perforation at terminal ileum 60 cm proximal to the ileocecal junction + candida infection on histopath after resection.	The 5 cm segment bearing the perforations was resected, and a double-barrel ileostomy was fashioned	POD 14	Vomiting, low-grade fever, bilateral moderate pulmonary effusion and jaundice (total bilirubin 3.4 mg/dl)	EGD + CT	Yes 3 week	-	Improved
[33]	Shreyas N/2023	37	Female	Intra-abdo minal abscess	Exploratory laparotomy + intra-abdominal abscess drainage	PO 5 years and 3 months	Nausea, vomiting, abdominal pain and distention with loss of weight, foul-smelling, purulent discharge just below the umbilicus	Upper GI contrast study CT scan	No	Side-to-side duodenojejunostomy without duodenal Mobilization	Improved
[17]	Gregory Wu/ 2022	31	Male	Ulcerative colitis	IPAA	PO 10 years	Anorexia with weight loss of up to 40 pounds in more recent years.	CT scan	NGTdecompression, IV fluid, jejunosto my tube, total parenteral nutrition	Yes Roux-En-Y gastrojeju nostomy	Improved

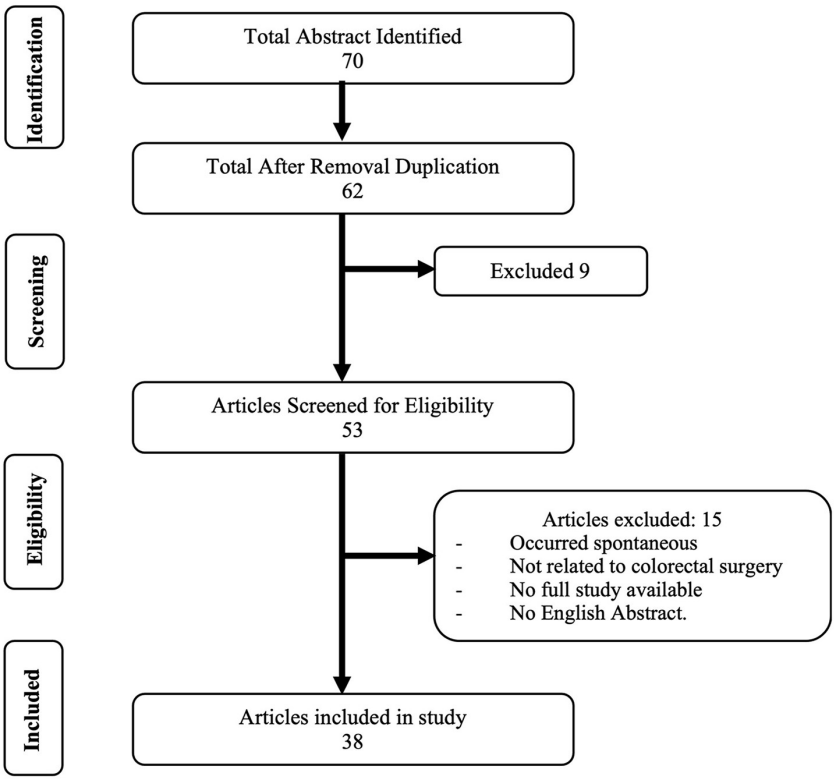

Figure 1. The flow diagram of study selection.

while 11.1% had multiple operations. Ulcerative colitis was the most common disease leading to surgery (19.4%).

Vomiting was the most common symptom among all patients (86.1%), followed by abdominal pain (36.1%). The time of onset of symptoms since the primary operation ranged from as short as 1 day to as long as over 10 years (Table 3). Among the 34 cases, 22 had successful conservative management, while 4 cases underwent immediate surgical intervention at presentation. One patient died from disease complications, and one elected to go for surgery, and these cases were excluded. There was a significant relation (P = 0.017) between the duration of conservative treatment and its success (Table 4). Figure 2 shows the distribution of patients by group and duration of conservative management.

A logistic regression analysis was conducted to evaluate the impact of age, duration of conservative management, and timing of diagnosis on the success of conservative treatment in patients with SMAS following colorectal surgery. Initially, the type of surgery was included as a predictor, but it caused perfect separation and was therefore excluded from the final model. The final model included 20 observations with age, duration (categorized as <2 weeks, 2–4 weeks, and >4 weeks), and timing of diagnosis (early vs. late) as predictors. Due to multicollinearity issues, the >4 weeks category was excluded from the final model. The results indicated that none of the predictors were statistically significant. Specifically, the coefficient for age was –0.0065 (P = 0.874), for duration (2–4 weeks) was –0.0571 (P = 0.954), and for timing of diagnosis was 0.8321 (P = 0.376). The model's pseudo R-squared value was 0.03215, suggesting that the included variables explained very little of the variance in the outcome. These findings indicate that, within the limitations of this dataset, age, duration of conservative management, and timing of diagnosis do not significantly predict the success of conservative treatment in SMAS patients following colorectal surgery (Table 4).

Table 2

Summary of data from cases included in the review

Characteristic	ALL (n = 36)	%
Age (y), mean ± SD	47.7 ± 23.9	
Gender		
Male	20	55.5
Female	16	44.4
First diagnosis		
Malignant		
FAP	4	11.1
Acceding colon lesions	6	16.6
Deseing colon lesions	5	13.9
Hepatic flexure lesions	1	2.7
Transverse colon lesions	1	2.7
Synchronies lesions	3	8.3
Small bowel lesions	2	5.5
Benign		
Cecal volvulus	1	2.7
Inflammatory		
UC	7	19.4
Infectious		
Appendicitis	1	2.7

(*Continues*)

Table 2

(Continued).

Characteristic	ALL (n = 36)	%
Abdominal TB	1	2.7
Intra-abdominal Abscess	1	2.7
Clostridium difficile colitis	1	2.7
Candida infection	1	2.7
Motility disorders		
Hirschsprung disease	1	2.7
Surgery performed		
Total proctocolectomy + ileal J-pouch anal anastomosis	15	41.6
Subtotal colectomy	4	11.1
Left hemicolectomy	3	8.3
Extended left hemicolectomy	1	2.7
Left hemicolectomy + LAR	1	2.7
Right hemicolectomy	3	8.3
LAR	2	5.5
Transverse colectomy	1	2.7
Small bowel resection	3	8.3
Intra-abdominal abscess drainage	1	2.7
Deloyers procedure	1	2.7
Cecopexy	1	2.7
Number of colorectal operations preformed		
Single operation	32	88.8
Multiple operations	4	11.1
Signs & Symptoms		
Nausea	8	22.2
Vomiting	31	86.1
Abdominal pain	13	36.1
Abdominal distension	12	33.3
Diarrhea	3	8.3
Increase NGT aspirate	3	8.3
No passage of gas through the ileostomy	2	5.5
Decreased oral intake	3	8.3
Wight loss	5	13.8
Treatment		
Successful conservative management	22	62.9
Failed conservative management	10	25.7
Immediate surgical management	4	11.4

Discussion

Diagnosis of SMAS post-surgical procedures is challenging due to nonspecific symptoms, including nausea, vomiting, abdominal pain, anorexia, and early satiety[1,2]. Our systematic review showed that the presentation may range from POD 1 to 10 years with commonest presentation at POD 5–10 (36.1 %), It is usually confirmed by imaging studies, with UGI series remaining the best diagnostic modality[6,7,19,23], demonstrating dilatation of the proximal duodenum with failure of contrast passage through the third part of the duodenum and cutoff[1]. CT angiography may demonstrate a narrowed aortomesenteric angle of <25° and aortomesenteric distance of <10 mm[1-7,9,15,17-22,24-27].

Table 3

Timing of postoperative presentation

Early, no. (%)			
POD 1–5	**POD 5–10**	**POD 10–15**	**POD 15–30**
8 (22.2%)	13 (36.1%)	7 (19.4%)	2 (5.5%)
Late, no. (%)			
POY 1–5	**POY 5–10**	**POY >10**	
3 (8.3%)	2 (5.5%)	1 (2.7%)	

Table 4

Stratified sociodemographic and clinical characteristics for successful versus failed conservative management

	Successful conservative treatment (N = 22)	Failed conservative treatment (N = 10)	*P*
Age (y), mean ± SD	46.5 ± 24.17	45.4 ± 21.7	
Gender			0.32
Male, no. (%)	15 (68.1 %)	4 (44.4 %)	
Female, no. (%)	7 (31.8 %)	5 (55.5 %)	
Surgery performed			
Total proctocolectomy + ileal J-pouch anal anastomosis	8 (36.3 %)	6 (66.6 %)	
Subtotal colectomy	2 (9 %)	1 (11.1 %)	
Left hemicolectomy	3 (13.6 %)	1 (11.1 %)	
Extended left hemicolectomy	0	0	
Left hemicolectomy + LAR	0	0	
LAR	2 (9 %)	0	
Right hemicolectomy	2 (9 %)	0	
Transverse colectomy	1 (4.5 %)	0	
Small bowel resection	3 (13.6 %)	0	
Deloyers procedure	1 (4.5 %)	0	
Cecopexy	0	1 (11.1 %)	
Early of postoperative presentation (d), no. (%)			
1–5	5 (22.7%)	2 (20%)	
5–10	9 (40.9%)	3 (30%)	
10–15	6 (27.2%)	2 (20%)	
Late of postoperative presentation (Y), no. (%)			
1–5	2 (9.1%)	0	
5–10	0	0	
>10	0	1 (10%)	
Duration of conservative management	(n = 14)	(n = 7)	0.017
<2 weeks	1 (7.1 %)	3 (42.9 %)	
2–4 weeks	11(78.5 %)	1 (14.2 %)	
>4 weeks	2 (14.9 %)	3 (42.9 %)	
Vomiting symptoms, no. (%)			0.93
Yes	20 (90.9%)	9 (90%)	
No	2 (9.1%)	1 (10%)	
Abdominal pain, no. (%)			0.21
Yes	8 (36.3%)	6 (60%)	
No	14 (63.6%)	4 (40%)	
Abdominal distension, no. (%)			0.12
Yes	8 (36.3%)	1 (10%)	
No	14 (63.6%)	9 (90%)	
Nausea symptoms, no. (%)			0.65
Yes	6 (27.2%)	2 (20 %)	
No	16 (72.7%)	8 (80 %)	

Conservative management is attempted initially through high calorie intake via parenteral feeding, decompression of the small bowel with a nasogastric tube, fluid resuscitation and correction of electrolyte abnormalities. Enteral feeding may be introduced with a nasojejunal tube placed distal to the obstruction.

The surgical management consisted of three procedures, namely, Strong's procedure (mobilizes the duodenum by dividing the ligament of Treitz. Once the duodenal-jejunal junction is mobilized, he

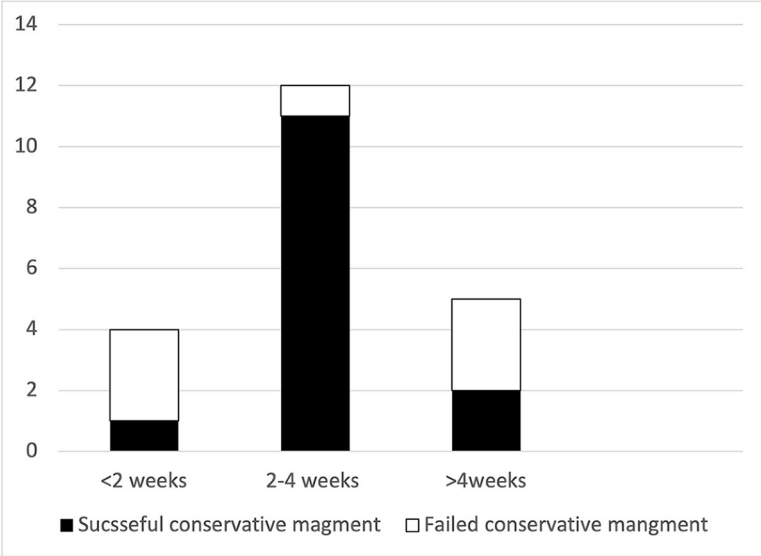

Figure 2. Distribution of patients by group and duration of conservative management.

duodenum is positioned to the right of the superior mesenteric artery), duodeno-jejunostomy, or a gastrojejunostomy[26]. The gastrojejunostomy is usually undertaken in the presence of gastric distention which has caused gastroparesis and delayed emptying of the stomach. The laparoscopic duodenojejunostomy is now the surgical procedure of choice[1,3,5-7,15,17,23,25,26] with success rates of over 90% over the long term[25]. Strong's procedure has a failure rate of over 25 % and is not currently recommended. However, its durability over the long term has been well demonstrated[21]. Vascular implantation of the superior mesenteric artery is only used as a last resort due to its attendant morbidity[25].

Upon the literature, preoperative preparation is needed to reduce the incidence of SMAS by nutritional support for severely malnourished patients 7–14 days, Intra-operative prevention measures to ensure tension free anastomosis, good vascularity, avoid excessive electrocautery to reduce the damage to the intestinal wall plexus, preforming strong procedure during first surgery especially in colorectal surgery with IPAA[3,5,9,20,23,24].

Previous studies have shown that diagnosing as well as managing SMAS is challenging due to its rarity and complexity[1-3,5-7,15,17,19,25,26] Our findings align with these studies, indicating that while conservative management can work, results vary widely. Our study found that following colorectal surgery 62.9% of patients with SMAS had successful conservative management, with the majority improving within 2–4 weeks (78.5%). This emphasizes the importance of early and aggressive conservative management, including high-calorie intake via parenteral feeding, nasogastric decompression, and correction of electrolyte imbalances. Enteral feeding may be introduced with a nasojejunal tube placed distal to the obstruction[1,2]. Despite this, those requiring more extended conservative treatment eventually resorted to surgical management.

Limitations

The limited number of cases, variability in reporting and missing data in some of the articles might have influenced results, retrospective nature of data collection, variability in patient populations, surgical techniques, and postoperative care protocols across the included studies, and short follow-up periods might potentially lid to a lack of statistical power to detect significant predictors. This highlights the need for individualized patient management strategies and more standardized treatment plans and larger, multicenter studies to confirm these outcomes.

Conclusions

The diagnosis of SMAS post-colorectal surgeries is based on high index of clinical suspicion and confirmed by imaging studies. It can be preventable by preoperative nutritional support and intraoperative techniques. While conservative management is often attempted, our analysis did not find a significant relationship between the duration of conservative management and its success, suggesting other factors might influence outcomes. Given the small sample size and limited variables, further research with larger sample sizes and additional variables is necessary.

Ethical approval

Systematic review are exempt from ethnical approval in our institution.

Consent

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Author's contribution

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Conflicts of interest disclosure

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Data availability statement

Data are publicly available.

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