



Case report

An arteriovenous malformation associated ischemic colitis in the setting of acute gastrointestinal *clostridium difficile* colitis and intestinal amebiasis: A case report

Iyad Maqboul^{a,*}, Khaled Demyati^b, Qusay Abdoh^b, Qotaiba Suleiman^b, Laith Daraghme^b

^a Department of Medicine Faculty of Medicine & Health Sciences, An-Najah National University Hospital, State of Palestine

^b An-Najah National University Hospital, State of Palestine

ARTICLE INFO

Keywords:

Ischemic colitis

Arteriovenous malformation

Gastrointestinal infection

Case report

ABSTRACT

Background: There is one reported case of inferior mesenteric arteriovenous malformation presenting as ischemic colitis after an episode of gastrointestinal infection. We documented this case to emphasize the possible association between ischemic colitis and vascular malformations. In addition, this is the number 15th case in the literature about this association.

Case summary: A 40 years old male patient presented with abdominal pain and diarrhea of 10 days duration after he was diagnosed and managed as a case of *Clostridium Difficile* infection and amebiasis. Computed tomography angiography revealed a vascular malformation of the inferior mesenteric artery, repeated colonoscopy showed ulceration and sloughing of the mucosa, he underwent Hartmann's procedure due to colonic ischemia diagnosed by the previous measures. Later on he had a colostomy closure and end to end colorectal anastomosis.

Conclusion: There is a possible association between acute gastrointestinal infection and ischemic colitis in the setting of arteriovenous malformation.

1. Introduction

There was one reported case published in 2017 of a case of inferior mesenteric arteriovenous malformation presenting as ischemic colitis after an acute episode of *Campylobacter Jejuni* colitis [1]. Ischemic colitis which is the most prevalent form of gastrointestinal ischemia [2] is a high mortality common disease, ulceration and hemorrhage ensues from mucosal inflammation when the blood supply cannot compensate for the demand. Watershed areas which are the areas between two major arteries supplying the colon are prone to ischemia and includes the splenic flexure (Griffith's point) and the recto-sigmoid junction (Sudek's point) [3]. The predominant mechanism to cause colonic ischemia is the low blood flow ischemia (non-occlusive ischemia) [4]. A rare risk factor for colonic ischemia to occur is a mesenteric arteriovenous fistula or malformation which leads to venous hypertension in the wall of the colon and can lead to chronic ischemic colitis [2]. Those patients who are a known case of chronic colonic ischemia and have multiple risk factors for colonic ischemia may require a more vigilant observation and management than others when they have an active gastrointestinal

infection.

Patient was admitted and managed at a non-profit medical and academic institution. This case report has been reported in line with the SCARE Criteria [5].

2. Presentation of case

A 40 years old male patient who is a known case of Factor V laden mutation with a past surgical history of varicocelectomy, appendectomy and a right double j stent Insertion with subsequent extracorporeal shock wave lithotripsy, with a drug history of coumadin on regular, presented to the emergency department by his family with a 10 days history of colicky abdominal pain associated with multiple episodes of watery diarrhea which was not mucoid nor bloody, his pain was not associated with meal ingestion and not relieved by defecation, there was no vomiting nor fever. Before presentation, he sought medical advice and was treated with oral metronidazole based on a positive stool analysis for *Entamoeba histolytica* (*E. histolytica*) in stool. Three days prior to admission he was diagnosed with *Clostridium Difficile* (C. Diff)

* Corresponding author.

E-mail addresses: imaqboul@najah.edu (I. Maqboul), khaleddemyati@najah.edu (K. Demyati), Qusayabdoh@najah.edu (Q. Abdoh), Qutiba.s@najah.edu (Q. Suleiman).

<https://doi.org/10.1016/j.ijscr.2023.108063>

Received 29 December 2022; Received in revised form 18 March 2023; Accepted 21 March 2023

Available online 30 March 2023

2210-2612/© 2023 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

infection by a gastroenterologist and was managed with oral vancomycin.

The patient was admitted and managed under care of gastroenterology team, he underwent diagnostic colonoscopy on the day of admission which was remarkable for inflamed, congested and edematous left side of colon without ulceration or erosions suggestive of colitis, biopsies were taken from terminal ileum, transverse colon and right colon and histopathology later on revealed no evidence of malignancy and nonspecific inflammation.

Abdominal x ray was remarkable for a loaded colon (Fig. 1). As the patient did not showed any clinical response to the given antibiotics and oral analgesia with the clinical picture of his severe abdominal pain and tenderness the decision was to go for abdomen and pelvic computed tomography (CT) scan with oral and Intravenous (IV) contrast during the initial 24 h of admission that showed a diffuse circumferential edematous wall thickening of the recto-sigmoid and descending colon with minimal free fluid in the paracolic gutters.

He was managed with IV metronidazole, oral vancomycin and hydration, his inflammatory markers decreased with time, and his abdominal pain improved significantly, accordingly he was discharged home after two days, but he returned back by his family after 3 days of discharge with a more severe picture of pain but at this time it was associated with tenesmus and constipation.

Initial evaluation revealed a well appearing patient, who was not pale, not jaundiced, not cyanosed nor in respiratory distress with stable vital signs. Chest and heart examinations were unremarkable with regular S1 S2 and no murmurs, heaves or thrills, with a good air entry bilaterally and a bilateral normal vesicular breathing sounds. His abdominal examination was only remarkable for a nonspecific generalized tenderness over the abdomen which was soft lax with audible active bowel sounds.

His laboratory results showed the following: Hemoglobin (HGB) 15 g/dL; white blood cell count (WBC) 7.46/ μ L; platelets (PLT) 334/ μ L; blood urea nitrogen (BUN) 18.2 mg/dL; creatinine (Cr) 0.88 mg/dL; magnesium (Mg) 2.23 mEq/L; aspartate aminotransferase (AST) 19 U/L; alanine aminotransferase (ALT) 18.6 U/L; c-reactive protein (CRP) 43 mg/L; sodium (Na) 138 mmol/L; potassium (K) 4.01 mmol/L; chloride (Cl) 103.5 mmol/L; international normalized ratio (INR) 1.03; partial prothrombin time (PTT) 25.1 s; erythrocyte sedimentation rate (ESR) 18 mm/h; clostridium (GDH): positive; *clostridium difficile* Toxin A: positive; *clostridium difficile* Toxin B: positive; stool examination showed brown, mucoid, parasite seen, Entamoeba cysts and trophozoites were

seen, WBC 12–14, fecal red blood cell count 2–3; fecal Calprotectin 32.2 mg/kg.

Surgical consultation was obtained and the decision was to go for repetition of the CT scan that showed these findings compared to the previous CT (6 days ago): a stable appearance of diffuse circumferential edematous wall thickening of the rectosigmoid and descending colon with stranding of surrounding fat planes and engorged mesenteric vessels, a loaded right colon, the oral contrast reached the hepatic flexure, there is also multiple mildly enlarged mesenteric lymph nodes with mild amount of abdominopelvic free fluid (Fig. 2).

On the 4th day of hospitalization (of the second admission), the patient started to have bloody stool, he was on IV metronidazole and oral vancomycin, so the decision was to go for diagnostic flexible sigmoidoscopy to rule out ischemic etiology which revealed a huge difference and worsening compared to the first colonoscopy with severe congested mucosa, severe luminal narrowing, severe ulceration, mucosal sloughing and mucosal discoloration of the sigmoid colon, less affected the rectum.

After these colonoscopic findings, he underwent CT angiography of the abdomen which showed stable appearance of diffuse circumferential edematous wall thickening of the rectum and descending colon and splenic flexure with stranding of surrounding fat planes and engorged mesenteric vessels. There are multiple tortuous vessels related to the inferior mesenteric artery suggesting vascular malformation. There is not visualization of the right common iliac vein likely due to chronic occlusion, and this resulted in extensive lower abdominal wall collaterals (Fig. 3).

After the results of angiography and colonoscopy, the impression was that the patient had ischemic bowel and he needs surgery, for which he underwent laparotomy, left hemicolectomy with end colostomy / hartmann's procedure. (5th day of admission).

On the first postoperative day the patient developed tachycardia, hypotension and drop in his hemoglobin level, he was rushed back to operation room for a second laparotomy, and there was significant number of clots, but no evidence of active bleeding. Irrigation was done, removal of all clots was done, dissection around the root of aorta till identification of inferior mesenteric artery which was ligated.

The patient was transferred to ward postoperatively, he was doing well, out of bed, his diet was upgraded and tolerated and he was discharged home after one week of second surgery.

Follow up diagnostic colonoscopy after surgery and discharge revealed a scope passed through anal verge up to 10 cm of rectum -

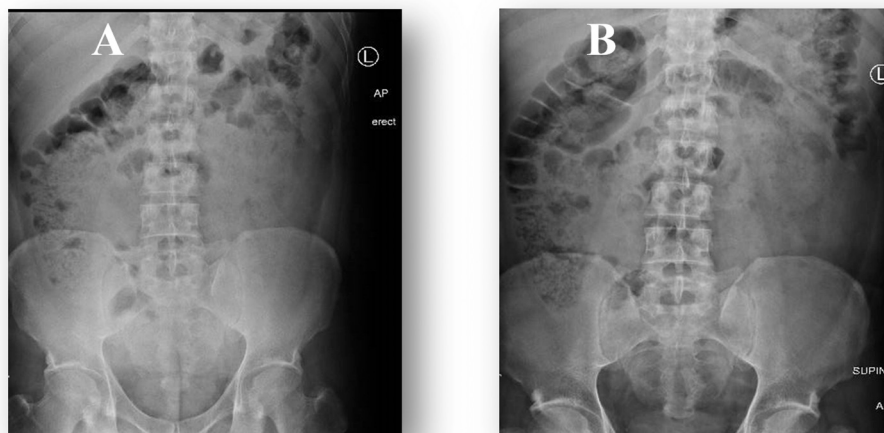


Fig. 1. X rays of the patient on the initial presentation to the emergency department
(A): Standing x ray showed a loaded colon with no abnormal calcifications and the visualized bone were unremarkable
(B): Supine x ray showed no dilatation in the bowel with a loaded colon.



Fig. 2. Abdomen and pelvis computed tomography with oral and IV contrast
 A: Coronal section which showed loaded right colon, the oral contrast reached the hepatic flexure.
 B: Another coronal section showed a diffuse circumferential edematous wall thickening of the recto-sigmoid and descending colon with stranding of surrounding fat planes and mild amount of abdominopelvic free fluid.
 C: Axial section showed wall thickening of the rectum with lower abdominal wall collaterals.

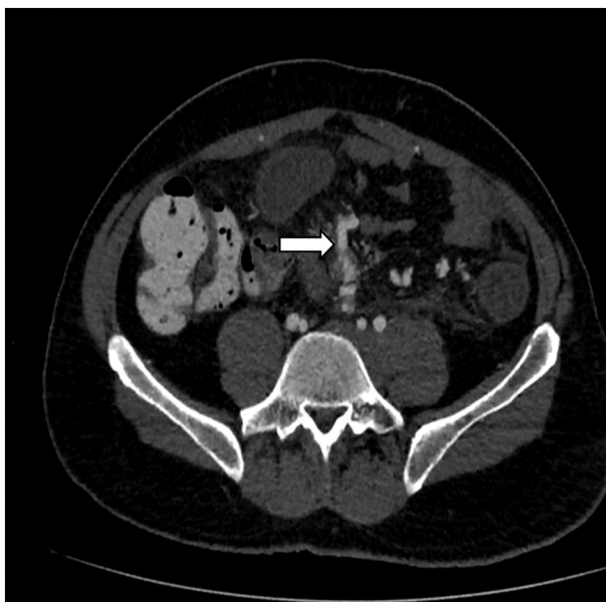


Fig. 3. Abdominal computed tomography angiography.
 Axial section showing multiple tortuous vessels related to inferior mesenteric artery, this raises possibility of vascular malformation (White arrow).

normal mucosa with fibrin - scope passed through colostomy up to terminal ileum showed normal mucosa.

Worthy to mention that all of the interventions in this case were performed by a specialized physicians who were included in the authors section.

2.1. Personal and family history

The patient denied any personal and family history of illness.

2.2. Histopathology examination

A three biopsies were obtained during the initial colonoscopy, one from the terminal ileum which showed a terminal ileal mucosa with follicular hyperplasia and no evidence of dysplasia or malignancy. There was mild nonspecific inflammation with no evidence of dysplasia or malignancy from those two biopsies obtained from the transverse and right colon. Left hemicolectomy specimen which showed a mucosal ischemic change, there was focal mucosal ulceration and pseudo-membranes formation with lamina propria hyalinization and sub-mucosal congestion in the colonic wall (Fig. 4), both cut ends are viable, four reactive lymph nodes harvested, the omentum shows mature adipose tissue, no evidence of dysplasia or malignancy.

2.3. Final diagnosis

Ischemic colitis caused by arteriovenous malformation involving the inferior mesenteric artery.

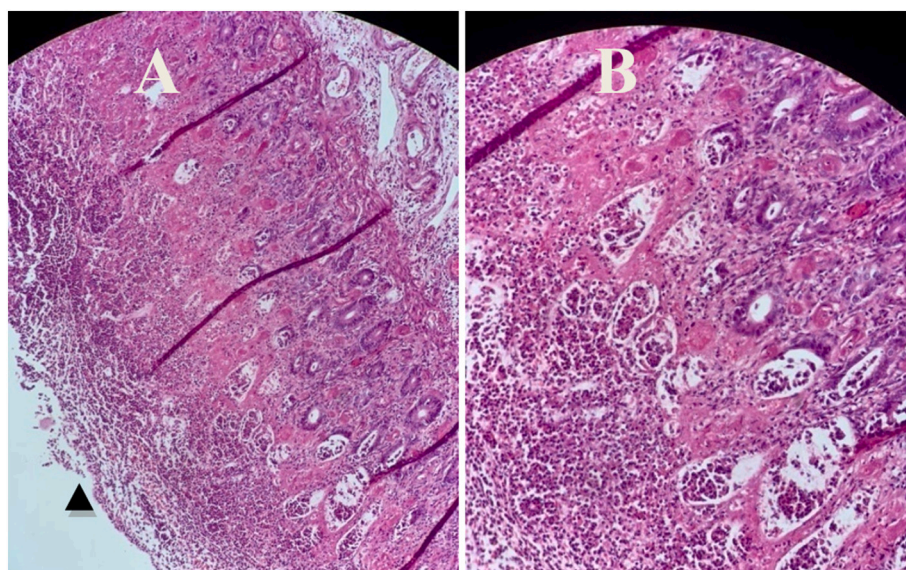


Fig. 4. Histopathology of the left hemicolectomy specimen

A: Focal mucosal ulceration (head arrow) with and pseudo-membrane formation with lamina propria

B: Another section showed hyalinization and sub-mucosal vascular congestion.

2.4. Treatment

Our male patient was managed conservatively initially, as he still had abdominal pain which is responding partially to given analgesia, he had a follow up colonoscopy which revealed severe congested mucosa with severe luminal narrowing and severe ulceration and mucosal sloughing with mucosal discoloration of the sigmoid colon. Accordingly, the plan was to go for surgical intervention.

2.5. Surgery

Based on the previous findings and the computed tomography (CT) evidence of arteriovenous malformation (AVM) of the inferior mesenteric artery (IMA) in the context of a critically ill patient with ischemic colitis who did not response to supportive and conservative management the plan was to go for laparotomy, left hemicolectomy with end colostomy / Hartmann's procedure. Intraoperatively there was evidence of left colonic ischemia from splenic flexure to recto-sigmoid junction (Fig. 5). There was significant thickness at mesenteric root, picture compatible with IMA AVM. Patient postoperatively (postoperative day one) developed tachycardia, hypotension and drop in his hemoglobin level, he was rushed back to operation room, for a second laparotomy, and there was significant number of clots, but no evidence of active

bleeding. Irrigation was done, removal of all clots was done. Dissection around the root of aorta till identification of inferior mesenteric artery which was ligated.

2.6. Outcome and follow-up

Two months later the patient underwent follow up diagnostic colonoscopy which revealed a scope passed through anal verge up to 10 cm of rectum and showed a normal mucosa with fibrin, then the Scope passed through colostomy up to terminal ileum and showed a normal mucosa. He underwent later on follow up computed tomography angiography which was unremarkable. Three months of discharge, the patient underwent Hartmann's colostomy closure with end-to-end colorectal anastomosis. There is no specific patient comments on the management plan that was applied.

3. Discussion

In the review of the literature there is a one reported case of ischemic colitis related arteriovenous malformation (AMV) in the setting of acute gastrointestinal infection [1]. The clinical picture of our patient on the initial presentation with colicky generalized abdominal pain, which was associated with multiple episodes of diarrhea (more than 4 times daily which was watery), the above-mentioned findings raise the suspension for an infectious gastrointestinal insult, he was managed initially as active *Clostridium difficile* (C. Diff) infection and *E. histolytica* with appropriate antibiotics. The diagnosis of C. Diff infection was made with positive C. Diff antigen, positive C. difficile Toxin A, and a positive glutamate dehydrogenase. C. diff infection should be considered when a more than three loose stools present during a 24 h period, diagnosis is made by detection of C. diff toxins directly in a stool sample, enzyme immunoassay which is the most popular test provides about 1–2 h turnaround time, a sensitivity of 75–85 % and specificity of 95–100 % [6].

Lactate dehydrogenase, lactate, creatine kinase, or amylase should be obtained for a diagnosis of ischemic colitis, however none of these laboratory tests are specific for ischemic colitis, accordingly a high index of suspicion is required to make up the diagnosis [7]. Conditions like strenuous physical activity, dehydration, illicit drugs, thrombophilic tendency, aortic surgery or cardiac bypass, vasculitis, major

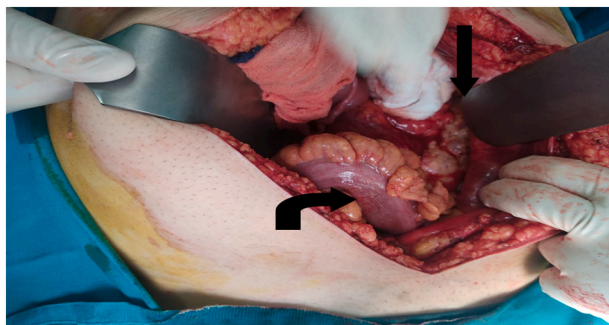


Fig. 5. Intra-operative view of the ischemic colon.

Evidence of left colonic ischemia from splenic flexure to recto-sigmoid junction Black arrow indicates dirty fat rapping and the curved arrow indicates left colonic ischemia.

cardiovascular episode accompanied by hypotension or an obstructing lesion of the colon predispose to ischemic colitis, and a special attention must be paid [8].

The clinical suspicion of ischemic colitis, or complications of it can be confirmed by computed tomography (CT) scan. However, intrinsic colonic abnormalities cannot be used to diagnose or predict the development of infarction [9]. In severe cases of ischemic colitis mesenteric angiography is justified. Acute mesenteric ischemia must be excluded in cases if there is only involvement of the right colon, suggesting involvement of the superior mesenteric artery [10]. However, in mild cases angiography is not indicated as colonic ischemia is mostly transient [11].

Ischemic colitis secondary to inferior mesenteric arteriovenous malformation (AVM) is rare and has been reported only 14 times in the literature (Table 1). Most patients were treated surgically with partial or total colectomy [11]. In case of AVM ischemia results from increased blood flow through the malformation which leads to venous hypertension and a decrease in arterial blood flow [12]. If the ischemia progresses to the point that the affected intestinal segments are not salvageable, the therapeutic approach consists of surgical resection of the infarcted bowel [11]. Based on hemodynamic parameters, risk factors, radiological and colonoscopic findings in addition to laboratory results colonic ischemic can be classified based on severity into mild, moderate and severe. The mild ischemia needs only conservative treatment. The moderate ischemia needs broad-spectrum antibiotics and surgical consultation. It is necessary to consider further investigation, such as CT angiography and colonoscopy, to assess the mesenteric circulation. Severe ischemia requires prompt surgical referral and intensive care unit monitoring [3].

Our male patient was managed conservatively initially, as he still had abdominal pain which is responding partially to given analgesia, he had a follow up colonoscopy which revealed severe congested mucosa with severe luminal narrowing and severe ulceration and mucosal sloughing with mucosal discoloration of the sigmoid colon. The plan was to go to surgery; accordingly, the plan was to go for surgical intervention.

Table 1
Case reports in the literature since 1970.

Reference	Journal	Patient age	Patient gender	Chief complaint	Treatment choice
In Hee Kim et al. [13] 2008	World journal of gastroenterology	46	M	Abdominal pain and hematochezia	Percutaneous transhepatic placement of a portal vein stent and left colectomy.
Kyoko Okada et al. [14] 2002	Internal medicine (Tokyo, Japan)	69	F	A space occupying lesion with bruit on abdominal examination	Sigmoidectomy with end-to-end anastomosis
Van Way et al. [15] 1971	Society for Vascular Surgery (US) Society of University Surgeons journal	72	F	Abdominal pain	Left colectomy
Houdard et al. [16] 1970	Arch Fr Mal App Dig	50	F	Abdominal pain and bloody diarrhea	Left colectomy
Sabatier et al. [17] 1978	J RadiolElectrol Med Nucl	22	M	Abdominal mass and bruit	None
Hirner et al. [18] 1978	Chirurg	43	F	Abdominal pain	Surgical excision
Oyama et al. [19] 1980	Nihon IgakuHoshasen Gakkai Zasshi	70	M	Abdominal mass	Left colectomy
Capron et al. [20] 1984	Gastroenterology	60	F	Abdominal pain	Intraarterial embolization
Manns et al. [21] 1990	Clin Radiol	33	M	Bloody diarrhea	Left colectomy
Baranda et al. [22] 1996	Eur J Gastroenterol Hepato	69	F	Bloody diarrhea	Left colectomy
Peer et al. [23] 1989	Cardiovascular and interventional radiology	63	M	Abdominal pain and bloody diarrhea	Left colectomy
Pietri et al. [24] 1990	Ann Vasc Surg	72	M	Abdominal mass	Left colectomy
Pietri et al. [24] 1990	Ann Vasc Surg	60	F	Abdominal pain and bloody diarrhea	Intraarterial embolization
Roy Hajjar et al. [1] 2017	International Journal of Radiology and Imaging Technology	54	M	Abdominal pain, tenesmus and bloody diarrhea	Angiographic embolization with Hartmann's procedure

M: Male, F: Female.

An important takeaway message in this case is that there was a delay in surgical intervention as there was a delay in making a proper diagnosis, so diagnosis requires a high index of suspicion.

4. Conclusion

Ischemic colitis carries a high morbidity outcome, those who are known to have an arteriovenous malformation should be followed and monitored closely in the setting of colonic stress including active gastrointestinal infection. We recommend a high index of suspension with a multidisciplinary approach in cases of clinical suspicion of colonic ischemia with early use of computed tomography angiography scan.

5. Limitations

In the computed tomography angiography, the inferior mesenteric vein could not be assessed well. In addition, there is no available records for the diagnostic endoscopies of the patient. Surgery was delayed in this case as the diagnosis was made once the patient started to have bloody diarrhea and worsening of abdominal pain and once colonoscopy and CT angiography were done.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval

All aspects of the study protocol, including access to and use of the patient clinical information, will be authorized by the Institutional Review Boards (IRB) and the local health authorities.

Funding

All Authors have no source of funding.

Author contribution

Study concept or design: Dr. Iyad Maqboul and Dr. Laith Daraghme

Writing the manuscript: Dr. Iyad Maqboul, Dr. Qotaiba Suleiman and Dr. Laith Daraghme

Review & editing the manuscript: Dr. Iyad Maqboul and Dr. Laith Daraghme

Data collection: Dr. Laith Daraghme

Guarantor

Dr. Laith Daraghme

Research registry number

No trial registry number.

Conflict of interest statement

All Authors have no conflict of interests.

References

- [1] R. Hajjar, et al., Inferior mesenteric arteriovenous malformation presenting as ischemic colitis after an acute episode of *Campylobacter jejuni* colitis, *Int. J. Radiol. Imaging Technol.* 3 (2017) 021 [Google Scholar].
- [2] D.R. Metcalf, S. Nivatvongs, J.C. Andrews, Ischemic colitis: an unusual case of inferior mesenteric arteriovenous fistula causing venous hypertension. Report of a case, *Dis. Colon Rectum* 51 (2008) 1422–1424 [PubMed] [Google Scholar].
- [3] A. Amini, S. Nagalli, Bowel Ischemia, *StatPearls* [Internet], Treasure Island (FL), 2022 [PubMed].
- [4] L.J. Brandt, P. Feuerstadt, G.F. Longstreth, S.J. Boley, American College of Gastroenterology, ACG clinical guideline: epidemiology, risk factors, patterns of presentation, diagnosis, and management of colon ischemia (CI), *Am J Gastroenterol* 110 (2015) 18–44 [Crossref] [Medline] [Google Scholar].
- [5] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus Surgical Case Report (SCARE) guidelines, *International Journal of Surgery* 84 (2020) 226–230 [PubMed] [Google Scholar].
- [6] J. Czepiel, M. Drozd, H. Pituch, E.J. Kuijper, W. Perucki, A. Mielimonka, S. Goldman, D. Wultanska, A. Garlicki, G. Biesiada, *Clostridium difficile* infection: review, *Eur. J. Clin. Microbiol. Infect. Dis.* 38 (7) (2019) 1211–1221 [CAS] [PubMed][Google Scholar].
- [7] J.F. Fitzgerald, L.O. Hernandez III, Ischemic colitis, *Clin Colon Rectal Surg* 28 (2015) 93–98, <https://doi.org/10.1055/s-0035-1549099> [PubMed] [CrossRef] [Google Scholar].
- [8] M. Tados, S. Majumder, J.W. Birk, A review of ischemic colitis: is our clinical recognition and management adequate? *Expert revGastroenterol. Hepatol.* 7 (2013) 605–613 [PubMed] [Google Scholar].
- [9] E.J. Balthazar, B.C. Yen, R.B. Gordon, Ischemic colitis: CT evaluation of 54 cases, *Radiology* 211 (1999) 381–388 [PubMed] [Google Scholar].
- [10] A. Theodoropoulou, I.E. Koutroubakis, Ischemic colitis: clinical practice in diagnosis and treatment, *World J. Gastroenterol.* 14 (48) (2008) 7302 [PMC free article] [PubMed] [Google Scholar].
- [11] M. Nogueira, R. González Costero, S. Méndez Alonso, J. Gómez-Patiño, A. García-Suarez, Endovascular treatment of an inferior mesenteric arteriovenous malformation causing ischemic colitis, *J. Vasc. Interv. Radiol.* 29 (2018) 1629–1631 [Crossref][PubMed] [Google Scholar].
- [12] E. Gorospe, C. Leggett, G. Sun, Inferior mesenteric arteriovenous malformation: an unusual cause of ischemic colitis, *Ann. Gastroenterol.* 25 (2012) 165 [PMC free article] [PubMed] [Google Scholar].
- [13] I.H. Kim, D.G. Kim, H.S. Kwak, H.C. Yu, B.H. Cho, H.S. Park, Ischemic colitis secondary to inferior mesenteric arteriovenous fistula and portal vein stenosis in a liver transplant recipient, *World J. Gastroenterol.* 14 (2008) 4249–4252 [PMC free article] [PubMed] [Google Scholar].
- [14] K. Okada, N. Furusyo, Y. Sawayama, N. Ishikawa, S. Nabeshima, T. Tsuchihashi, S. Kashiwagi, J. Hayashi, Inferior mesenteric arteriovenous fistula eight years after sigmoidectomy, *Intern. Med.* 41 (2002) 543–548 [PubMed] [Google Scholar].
- [15] C.W. Van Way, Riddell D.H. CJ, et al., Arteriovenous fistula in the portal circulation, *Surgery* 70 (1971) 876–890 [PubMed] [Google Scholar].
- [16] C. Houdard, C. Helenon, J.F. Carles, et al., Inferior mesenteric arteriovenous fistula and ulcerative rectocolitis, *Arch Fr Mal App Dig.* 59 (7) (1970) 463–474 [PubMed] [Google Scholar].
- [17] J.C. Sabatier, J.N. Bruneton, J. Drouillard, G. Elie, J. Tavernier, Inferior mesenteric arteriovenous fistula of congenital origin. A report on one case and review of the published literature (author's transl), *J. Radiol. Electrol. Med. Nucl.* 59 (1978) 727–729 [PubMed] [Google Scholar].
- [18] A. Hirner, R. Häring, H. Bost, R. Sörensen, Hyperkinetic portal hypertension. Arteriportal fistula: problems—case reports—review of the literature, *Chirurg* 49 (1978) 303–310 [PubMed] [Google Scholar].
- [19] K. Oyama, S. Hayashi, T. Kogure, K. Kirakawa, A. Akaike, Inferior mesenteric arteriovenous fistula. -report of a case and review of the literature, *Nihon Igaku Hoshasen Gakkai Zasshi* 40 (10) (1980 Oct 25) 944–950. PMID: 7243537. [PubMed].
- [20] J.P. Capron, J.L. Gineston, A. Remond, Inferior mesenteric arteriovenous fistula associated with portal hypertension and acute ischemic colitis. Successful occlusion by intraarterial embolization with steel coils, *Gastroenterology* 86 (1984) 351–355 [PubMed] [Google Scholar] [CAS].
- [21] R.A. Manns, C.R. Vickers, I.M. Chesner, P. McMaster, E. Elias, Portal hypertension secondary to sigmoid colon arteriovenous malformation, *Clin. Radiol.* 42 (1990) 203–204 [PubMed] [Google Scholar].
- [22] J. Baranda, J.M. Pontes, F. Portela, L. Silveira, P. Amaro, P. Ministro, A. Rosa, I. Pimenta, P. Andrade, A. Bernardes, et al., Mesenteric arteriovenous fistula causing portal hypertension and bleeding duodenal varices, *Eur. J. Gastroenterol. Hepatol.* 8 (1996) 1223–1225 [PubMed] [Google Scholar].
- [23] A. Peer, S. Slutzki, E. Witz, R. Abrahmsohn, H. Bogokowsky, Y. Leonov, Transcatheter occlusion of inferior mesenteric arteriovenous fistula: a case report, *Cardiovasc. Intervent. Radiol.* 12 (1989) 35–37 [PubMed] [Google Scholar].
- [24] J. Pietri, A. Remond, T. Reix, D. Abet, H. Sevestre, M.A. Sevestre, Arteriportal fistulas: twelve cases, *Ann. Vasc. Surg.* 4 (1990) 533–539 [PubMed] [Google Scholar].