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*Martino A, Di Serafino M, Zito FP, Maglione F, Bennato R, Orsini L, Iacobelli A, Niola R, Romano L, Lombardi G*

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## Massive bleeding from gastric submucosal arterial collaterals secondary to splenic artery thrombosis: A case report

Alberto Martino, Marco Di Serafino, Francesco Paolo Zito, Franco Maglione, Raffaele Bennato, Luigi Orsini, Alessandro Iacobelli, Raffaella Niola, Luigia Romano, Giovanni Lombardi

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### Abstract

#### BACKGROUND

Gastric submucosal arterial collaterals (GSAC) secondary to splenic artery occlusion is an extraordinary rare and potentially life-threatening cause of acute upper gastrointestinal bleeding. Here, we report a case of massive bleeding from GSAC successfully treated by means of a multidisciplinary minimally invasive approach.

#### CASE SUMMARY

A 60-year-old non-cirrhotic gentleman with a history of arterial hypertension was admitted due to hematemesis. Emergent esophagogastroduodenoscopy revealed pulsating and tortuous varicose shaped submucosal vessels in the gastric fundus along with a small erosion overlying one of the vessels. In order to characterize the fundic lesion, pre-operative emergent computed tomography-angiography was performed showing splenic artery thrombosis (SAT) and tortuous arterial structures arising from the left gastric artery and the left gastroepiploic artery in the gastric fundus. GSAC was successfully treated by means of a minimally invasive step-up approach consisting in endoscopic clipping followed by transcatheter arterial embolization (TAE).

## CONCLUSION

This was a previously unreported case of bleeding GSAC secondary to SAT successfully managed by means of a multidisciplinary minimally invasive approach consisting in endoscopic clipping for the luminal bleeding control followed by elective TAE for the definitive treatment.

**Key Words:** Upper gastrointestinal bleeding; Non variceal upper gastrointestinal bleeding; Acute upper gastrointestinal bleeding; Gastric submucosal arterial collaterals; Splenic artery thrombosis; Case report

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**Core Tip:** Gastric submucosal arterial collaterals (GSAC) secondary to splenic artery occlusion is an extremely rare cause of severe non variceal upper gastrointestinal bleeding. Herein, we describe a previously unreported case of massive bleeding from GSAC secondary to splenic artery thrombosis effectively treated by endoscopic mechanical hemostasis followed by endovascular embolization.

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## INTRODUCTION

Acute upper gastrointestinal bleeding (UGIB) is a common gastroenterological emergency associated with significant morbidity and mortality. Reported hospitalization rate is 61-78 cases *per* 100.000 adults *per* year[1-3], whereas estimated overall mortality is around 10% [4,5]. Peptic ulcers are the most common cause of acute UGIB, followed by oesophageal varices, Mallory-Weiss syndrome and neoplasms[1,3,4]. Acute UGIB caused by gastric submucosal arterial collaterals (GSAC) secondary to splenic artery occlusion (SAO) is extremely rare, with only few cases reported worldwide up to date. Herein, we describe a previously unreported case of bleeding GSAC secondary to splenic artery thrombosis (SAT) successfully treated by means of endoscopic mechanical hemostasis followed by endovascular embolization.

## CASE PRESENTATION

### Chief complaints

A 60-year-old non-cirrhotic gentleman was admitted to our dedicated bleed unit for severe anemia (hemoglobin 4.8 g/dL on admission) and recent onset of hematemesis and melena with unstable hemodynamic parameters.

### History of present illness

One attack of hematemesis and two episodes of melena occurred two and 24 h prior to the hospital admission, respectively.

### History of past illness

The patient had a history of arterial hypertension. He denied any history of, or risk factors for, liver disease, pancreatitis, abdominal trauma and hypercoagulable states.

### Personal and family history

The patient denied personal and family history.

### Physical examination

At admission, the patient was hemodynamically unstable (pulse of 110 bpm, blood pressure of 100/50 mmHg). He was afebrile, with respiratory rate of 15 rpm and oxygen saturation of 98%. His physical examination was negative for any evidence of portal hypertension or other stigmata of chronic liver disease. Abdominal examination revealed non-distended, non-tender abdomen with normoactive bowel sounds. The digital rectal examination showed black terry feces.

### **Laboratory examinations**

Complete blood count revealed a hemoglobin level of 4.8 g/dL and hematocrit of 14.6%. All other laboratoristic exams, including coagulation, liver and renal function tests, were within normal values.

### **Imaging examinations**

Following high-dose intravenous proton pump inhibitor administration, blood transfusion and hemodynamic stabilization, emergent esophagogastroduodenoscopy (EGD) under monitored anaesthesia care was performed. A moderate amount of fresh blood within the stomach was noted and fully aspirated. The retroflexion maneuver revealed varicose shaped pulsating and tortuous submucosal vessels in the gastric fundus without active bleeding. A small erosion overlying one of the vessels consistent with an area of recent healed rupture was noted (Figure 1). Given the absence of clinical or laboratory signs of portal hypertension, we decided to perform emergent computed tomography-angiography (CTA) in order to further characterize the fundic lesion and to look for signs of portal hypertension. SAT and tortuous arterial structures emerging from the left gastric artery (LGA) and the left gastroepiploic artery (LGEA) in the gastric fundus were showed. No signs of active bleeding were observed (Figure 2).

### **Further hospital course**

Given the high-risk of massive early rebleeding due to the presence of a small erosion overlying one of the GSAC vessels, we decided to attempt therapeutic EGD in order to provide definitive treatment in a more stable non-emergent setting. The patient was informed that in case of luminal bleeding control failure, emergent transcatheter arterial embolization (TAE) would be performed by the pre-alerted interventional radiologist. Immediately after the first endoclip application downstream to the mucosal erosion, spurting bleeding started. Hemostasis was achieved by means of two endoclips placement upstream to the mucosal defect. Finally, two endoclips were further prophylactically positioned (Figure 3 and Video 1).

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## **MULTIDISCIPLINARY EXPERT CONSULTATION**

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No rebleeding was observed following the endoscopic treatment. However, the patient refused splenectomy for definitive treatment. Therefore, after multidisciplinary evaluation, involving GI endoscopist, surgeon, diagnostic and interventional radiologist, a minimally-invasive approach with elective TAE was planned.

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## **FINAL DIAGNOSIS**

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Non variceal acute UGIB from GSAC secondary to SAT.

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## **TREATMENT**

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Operative angiography showed SAT with multiple collateral arteries arising from the LGA and the LGEA and projecting in the gastric fundus (Figure 4). Selective TAE of the LGA collaterals with trisacryl gelatin microspheres (Embospheres, Guerbet Biomedical, Louvres, France) was effectively realized.

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## **OUTCOME AND FOLLOW-UP**

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Post-operative stay was complicated by splenic infarction, responsive to conservative treatment (Figure 5). The patient underwent hematology consultation and thrombophilic disorders were excluded. No rebleeding occurred. The patient was discharged with stable haemoglobin value (9.1 g/dL) on post-operative day 18. No rebleeding was observed at 12-mo follow-up.

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## **DISCUSSION**

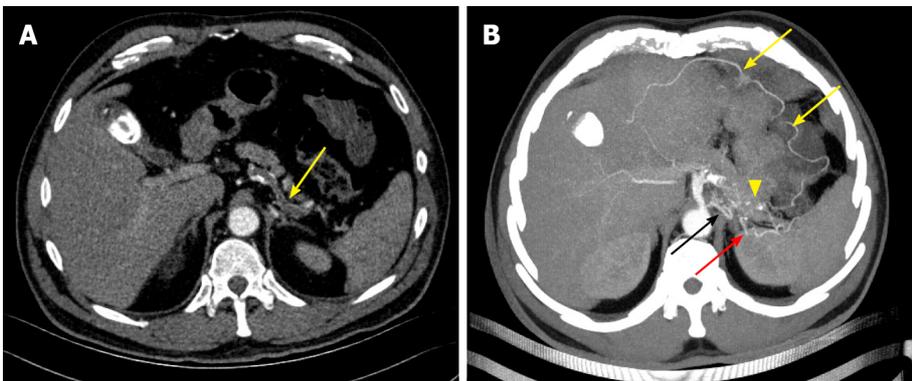
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GSAC are an extraordinary rare cause of massive UGIB. They are not related to portal hypertension, resulting from either occlusion or congenital absence of the SA. SAO may be congenital, idiopathic, or secondary to various conditions such as surgery, endovascular procedure, trauma and extrinsic compression. In the case of SAO, in order to provide splenic blood supply, extensive collaterals may



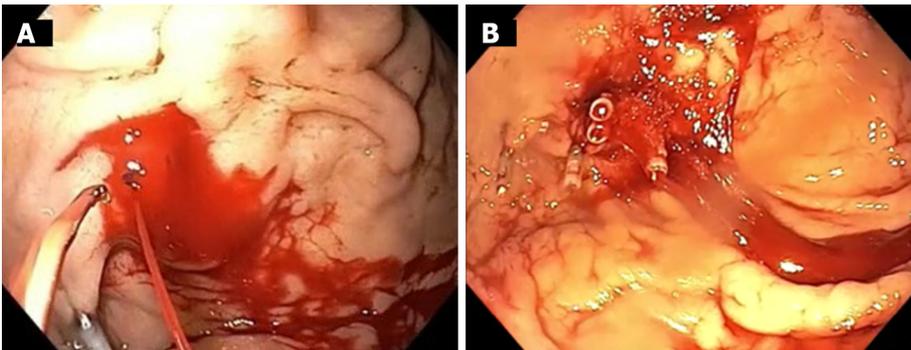
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**Figure 1 Emergent esophagogastroduodenoscopy: Retroflexed view of the gastric fundus showing varicose-shaped submucosal vessels with a small erosion (arrow).**



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**Figure 2 Emergent computed tomography angiography: Axial view.** A: Arterial phase showing complete splenic artery thrombosis (arrow); B: Arterial phase curved-multiplanar reconstruction showing splenic artery collateral vessels (yellow arrows) with an arterial cluster at the gastric fundus (arrowhead) arising from the left gastric artery (black arrow) and the left gastroepiploic artery (red arrow).

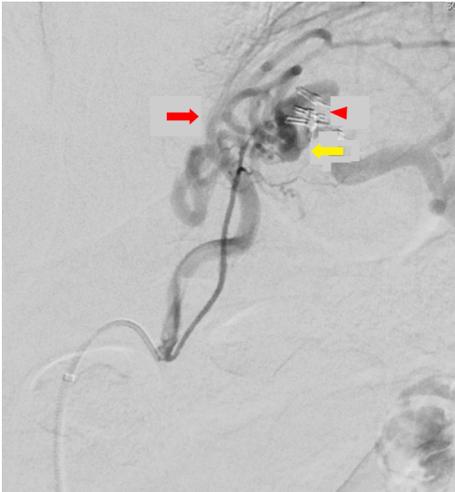


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**Figure 3 Therapeutic esophagogastroduodenoscopy.** A: Spurring active bleeding of the gastric submucosal arterial collaterals after first endoclip application; B: Successful mechanical hemostasis achievement.

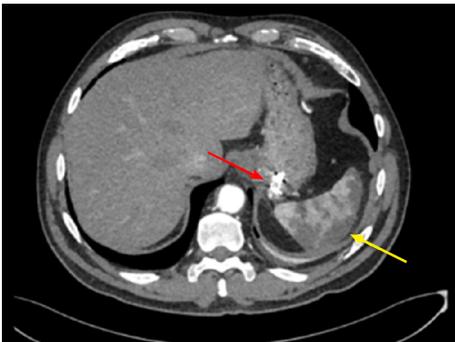
arise from adjacent proximal patent arteries, such as the pancreatic, left gastric, gastroepiploic, and short gastric arteries and pass through the gastric wall[6]. Collateral supply may be clinically asymptomatic or may less frequently present with massive UGIB from erosion of GSAC.

The differential diagnosis of GSAC includes mainly isolated gastric varices (IGV). Gastric vascular lesions due to collateralization of an occluded splenic artery may have a very similar endoscopic appearance to IGV and can be easily misinterpreted on EGD. However, they are, as opposed to GSAC, due to cirrhotic portal hypertension or splenic vein obstruction resulting in left-sided portal hypertension[7,8]. Therefore, an accurate differential diagnosis between these two entities is crucial. Indeed, endoscopic cyanoacrylate glue injection (ECGI), currently recommended as the first-line treatment for



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**Figure 4** Operative angiography showing a cluster of collateral arterial vessels emerging from the left gastric artery (red arrow) and the left gastroepiploic artery (yellow arrow) projecting into the gastric fundus. It also shows previously placed endoclips on the submucosal collateral arteries of the gastric fundus without active contrast extravasation (arrowhead).



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**Figure 5** Post-operative computed tomography angiography: Axial view showing collateral arteries of the gastric fundus treated by endoscopic clipping plus microspheres embolization (red arrow) and splenic infarction (yellow arrow).

bleeding IGV[9], is associated with a significant risk of systemic embolization and life-threatening adverse events in case of direct arterial injection of cyanoacrylate[10-12]. Finally, fatal arterial embolic complications in hepatolienogastric blood supply have been reported during ECGI to a non-variceal bleeding source[13-16]. A high level of diagnostic certainty is thus required before proceeding with ECGI.

We performed a comprehensive literature search of PubMed/MEDLINE and EMBASE electronic databases up to March 2022, identifying 10 case reports of GSAC secondary to SAO (Table 1).

In 1984, Spriggs[17] first reported a case of severe UGIB due to GSAC secondary to SA congenital absence[17]. The diagnosis was made by arteriography and the treatment consisted in splenectomy followed by partial gastrectomy due to rebleeding. Later on, a similar case was reported, effectively treated by means of splenectomy after ligation of the LGA[18].

In 2000, Baron *et al*[19] reported a case of bleeding GSAC secondary to post-traumatic SAO. It was diagnosed by operative angiography and successfully treated by splenectomy and partial gastric devascularization[19]. Subsequently, Worthley and colleagues described a case of UGIB secondary to SAO due to previous SA aneurysmectomy. As previously reported, it was managed by angiography followed by splenectomy with ligation of the splenic vein and artery together with the left gastric and short gastric arteries[20].

In 2004, Cyraný *et al*[21,22] illustrated the first case of massive UGIB from GSAC secondary to SAT successfully managed endoscopically. Of interest, pre-operative diagnosis was made by endoscopy only, and treatment consisted in ECGI alone. No rebleeding was observed. However, post-procedural stay was complicated by the occurrence of splenic infarction, treated conservatively[21,22].

Later on, the first case of bleeding GSAC successfully treated by endovascular embolization alone was reported by Mnatzakanian *et al*[23] Pre-operative accurate diagnosis was made by CTA followed by

**Table 1 Summary of case reports reporting acute upper gastrointestinal bleeding from gastric submucosal arterial collaterals secondary to occlusion or congenital absence of the splenic artery**

Case	Ref.	Age/sex	Presentation	SAO etiology	Diagnosis	Treatment	Major AEs	Outcome	Follow-up (months)
1	Spriggs[17], 1984	31/M	Hematemesis	SA congenital absence	Angiography	Splenectomy + partial gastrectomy (due to rebleeding)	Severe respiratory distress	Alive-no rebleeding	-
2	Durrans <i>et al</i> [18], 1985	13/M	Hematemesis	SA congenital absence	Angiography	LGA ligation + splenectomy	None	Alive-no rebleeding	-
3	Baron <i>et al</i> [19], 2000	36/M	Hematemesis	Blunt abdominal trauma	Angiography	Splenectomy + partial gastric devascularization	None	Alive-no rebleeding	18
4	Worthley <i>et al</i> [20], 2003	68/F	Melena	Iatrogenic(SA aneurysmectomy)	Angiography	Splenectomy + ligation of SV and SA with LGA and SGA	None	Alive-no rebleeding	-
5	Cyrany <i>et al</i> [21], 2004	59/M	Hematemesis and melena	SAT	CTA + angiography	ECGI	Splenic infarction	Alive-no rebleeding	9
6	Mnatzakanian <i>et al</i> [23], 2008	66/M	Melena	-	CTA + angiography	TAE (coils and pledgets)	None	Alive-no rebleeding	-
7	von Trotha <i>et al</i> [26], 2011	69/M	-	SAT	CTA + angiography + EUS	ECGI + endoscopic clipping + splenectomy and SGA collaterals dissection	Splenic infarction	Alive-no rebleeding	6
8	Saddekni <i>et al</i> [24], 2012	23/F	Hematemesis and melena	Iatrogenic (SA ligation)	CTA + angiography	TAE (coils)	None	Alive-no rebleeding	8
9	Arslan <i>et al</i> [27], 2017	52/M	Hematemesis	SAT	CTA	-	-	Death	-
10	Al-Balas <i>et al</i> [25], 2021	49/M	Hematemesis	SAT	CTA + angiography	TAE (coils) + splenectomy and bleeding gastric vessel ligation (due to rebleeding)	None	Alive-no rebleeding	18
11	Our case	60/M	Hematemesis and melena	SAT	CTA + angiography	Endoscopic clipping + TAE (microspheres)	Splenic infarction	Alive-no rebleeding	12

SAO: Splenic artery occlusion; AEs: Adverse events; SA: Splenic artery; LGA: Left gastric artery; SGA: Short gastric arteries; SAT: Splenic artery thrombosis; CTA: Computed tomography angiography; ECGI: Endoscopic cyanoacrylate glue injection; TAE: Transcatheter arterial embolization; EUS: Endoscopic ultrasound.

angiogram, in order to rule out IGV. No procedure-related major adverse events were observed[23]. Few years later, another case successfully managed in a very similar manner was described[24]. Conversely, Al-Balas *et al*[25] recently reported a case of bleeding GSAC initially managed *via* TEA and subsequently requiring emergency laparotomy with ligation of a bleeding gastric vessel and splenectomy due to severe rebleeding occurrence[25].

In 2011, von Trotha *et al*[26] reported a case of bleeding GSAC secondary to idiopathic SAT. GSAC was endoscopically misdiagnosed as type 1 IGV and ECGI with subsequent clipping was performed in order to control active bleeding. Of note, the authors did not clarify the choice for endoscopic clipping adoption in the setting of supposed IGV. Furthermore, as previously reported by Cyrany and colleagues, ECGI was complicated by splenic infarction. A proper diagnosis was subsequently made by CTA and conventional angiography. Interestingly, endoscopic color doppler ultrasonography was adopted to secure the diagnosis and laparoscopic splenectomy was finally provided for the definitive treatment[26].

Up to date, one case only of fatal UGIB due to GSAC has been reported. In this instance, urgent EGD failed to identify the source of bleeding. CTA examination was then performed showing GSAC due to SAT, in the absence of active bleeding. However, after diagnosis, no treatment was provided and death due to recurrent bleeding occurred[27].

Our case is the first report in which bleeding GSAC was effectively treated with endoscopic mechanical hemostasis alone for the luminal bleeding control and subsequent elective TAE for the definitive treatment. Given the absence of active bleeding and portal hypertension signs or history, emergent CTA was performed prior to endoscopic treatment in order to properly characterize the gastric vascular lesion. Following endoscopic treatment neither adverse events nor rebleeding signs

occurred. The patient refused splenectomy with or without partial gastrectomy for the definitive treatment. Thus, following multidisciplinary evaluation, elective TAE was planned and effectively realized. Post-operative stay was complicated by splenic ischemia, effectively treated by conservative medical treatment. In our case, the presumed etiology of GSAC was idiopathic SAT. Given the formation of an extensive collateral pathway preserving the splenic perfusion, complete SAO likely occurred gradually.

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## CONCLUSION

Gastroenterologists should be aware of this potentially life-threatening, albeit extraordinary rare, source of massive upper gastrointestinal hemorrhage, in order to allow proper management. In our opinion, endoscopic mechanical hemostasis seems to be a safe and effective method for the luminal bleeding control across referral centers. Conversely, we may not recommend ECGI adoption given the potential occurrence of fatal adverse events due to arterial embolization. CTA appears to be the best modality for a prompt differential diagnosis, and should be performed in all UGIB patients with endoscopic evidence of gastric varicose shaped submucosal vessels and no signs or history of portal hypertension. For the definitive treatment of bleeding GSAC, either a minimally invasive approach with TAE or a standard approach with splenectomy may be provided, taking into account patient preference and status.

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## FOOTNOTES

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## REFERENCES

- 1 **Laine L**, Yang H, Chang SC, Datto C. Trends for incidence of hospitalization and death due to GI complications in the United States from 2001 to 2009. *Am J Gastroenterol* 2012; **107**: 1190-5; quiz 1196 [PMID: [22688850](#) DOI: [10.1038/ajg.2012.168](#)]
- 2 **Abougergi MS**, Travis AC, Saltzman JR. The in-hospital mortality rate for upper GI hemorrhage has decreased over 2 decades in the United States: a nationwide analysis. *Gastrointest Endosc* 2015; **81**: 882-8.e1 [PMID: [25484324](#) DOI: [10.1016/j.gie.2014.09.027](#)]
- 3 **Wuerth BA**, Rockey DC. Changing Epidemiology of Upper Gastrointestinal Hemorrhage in the Last Decade: A Nationwide Analysis. *Dig Dis Sci* 2018; **63**: 1286-1293 [PMID: [29282637](#) DOI: [10.1007/s10620-017-4882-6](#)]
- 4 **Hearnshaw SA**, Logan RF, Lowe D, Travis SP, Murphy MF, Palmer KR. Acute upper gastrointestinal bleeding in the UK: patient characteristics, diagnoses and outcomes in the 2007 UK audit. *Gut* 2011; **60**: 1327-1335 [PMID: [21490373](#) DOI: [10.1136/gut.2010.228437](#)]
- 5 **Nahon S**, Hagège H, Latrive JP, Rosa I, Nalet B, Bour B, Faroux R, Gower P, Arpurt JP, Denis J, Henrion J, Rémy AJ, Pariente A; Groupe des Hémorragies Digestives Hautes de l'ANGH. Epidemiological and prognostic factors involved in upper gastrointestinal bleeding: results of a French prospective multicenter study. *Endoscopy* 2012; **44**: 998-1008 [PMID: [23108771](#) DOI: [10.1055/s-0032-1310006](#)]
- 6 **Stolze T**, Wienbeck M. [The collateral circulation in the chronic occlusion of the splenic artery]. *Rofo* 1976; **124**: 386-387 [PMID: [131773](#) DOI: [10.1055/s-0029-1230356](#)]
- 7 **Sarin SK**, Jain AK, Lamba GS, Gupta R, Chowdhary A. Isolated gastric varices: prevalence, clinical relevance and natural history. *Dig Surg* 2003; **20**: 42-47 [PMID: [12637804](#) DOI: [10.1159/000068865](#)]
- 8 **Köklü S**, Coban S, Yüksel O, Arhan M. Left-sided portal hypertension. *Dig Dis Sci* 2007; **52**: 1141-1149 [PMID: [17385040](#) DOI: [10.1007/s10620-006-9307-x](#)]
- 9 **de Franchis R**, Bosch J, Garcia-Tsao G, Reiberger T, Ripoll C; Baveno VII Faculty. Baveno VII - Renewing consensus in portal hypertension. *J Hepatol* 2022; **76**: 959-974 [PMID: [35120736](#) DOI: [10.1016/j.jhep.2021.12.022](#)]
- 10 **Lee CW**, Liu KL, Wang HP, Chen SJ, Tsang YM, Liu HM. Transcatheter arterial embolization of acute upper gastrointestinal tract bleeding with N-butyl-2-cyanoacrylate. *J Vasc Interv Radiol* 2007; **18**: 209-216 [PMID: [17327553](#) DOI: [10.1016/j.jvir.2006.12.003](#)]
- 11 **Jaе HJ**, Chung JW, Jung AY, Lee W, Park JH. Transcatheter arterial embolization of nonvariceal upper gastrointestinal bleeding with N-butyl cyanoacrylate. *Korean J Radiol* 2007; **8**: 48-56 [PMID: [17277563](#) DOI: [10.3348/kjr.2007.8.1.48](#)]
- 12 **Kim BS**, Do HM, Razavi M. N-butyl cyanoacrylate glue embolization of splenic artery aneurysms. *J Vasc Interv Radiol* 2004; **15**: 91-94 [PMID: [14709694](#) DOI: [10.1097/01.rvi.0000099537.29957.13](#)]
- 13 **Lee GH**, Kim JH, Lee KJ, Yoo BM, Hahm KB, Cho SW, Park YS, Moon YS. Life-threatening intraabdominal arterial embolization after histoacryl injection for bleeding gastric ulcer. *Endoscopy* 2000; **32**: 422-424 [PMID: [10817185](#) DOI: [10.1055/s-2000-9002](#)]
- 14 **Lee KJ**, Kim JH, Hahm KB, Cho SW, Park YS. Randomized trial of N-butyl-2-cyanoacrylate compared with injection of hypertonic saline-epinephrine in the endoscopic treatment of bleeding peptic ulcers. *Endoscopy* 2000; **32**: 505-511 [PMID: [10917181](#) DOI: [10.1055/s-2000-3816](#)]
- 15 **Kobilica N**, Flis V, Sojar V. Major complication after Histoacryl injection for endoscopic treatment of bleeding peptic ulcer. *Endoscopy* 2012; **44** Suppl 2 UCTN: E204-E205 [PMID: [22622746](#) DOI: [10.1055/s-0032-1308923](#)]
- 16 **Vallieres E**, Jamieson C, Haber GB, Mackenzie RL. Pancreatoduodenal necrosis after endoscopic injection of cyanoacrylate to treat a bleeding duodenal ulcer: a case report. *Surgery* 1989; **106**: 901-903 [PMID: [2814823](#)]
- 17 **Spriggs DW**. Congenital absence of the splenic artery. *Cardiovasc Intervent Radiol* 1984; **7**: 303-305 [PMID: [6335674](#) DOI: [10.1007/BF02625116](#)]
- 18 **Durrans D**, Fawcitt RA, Taylor TV. Congenital absence of the splenic artery associated with major gastric bleeding in adolescence. *Br J Surg* 1985; **72**: 456-457 [PMID: [3874675](#) DOI: [10.1002/bjs.1800720618](#)]
- 19 **Baron PW**, Sindram D, Suhocki P, Webb DD, Clavien PA. Upper gastrointestinal bleeding from gastric submucosal arterial collaterals secondary to splenic artery occlusion: treatment by splenectomy and partial gastric devascularization. *Am J Gastroenterol* 2000; **95**: 3003-3004 [PMID: [11051401](#) DOI: [10.1111/j.1572-0241.2000.03228.x](#)]
- 20 **Worthley DL**, Rayner CK, Devitt PG, Fraser R. Gastric hemorrhage as a late complication of splenic artery aneurysm repair: a dramatic way to vent one's spleen. *J Gastroenterol Hepatol* 2003; **18**: 604-605 [PMID: [12702057](#) DOI: [10.1046/j.1440-1746.2003.03012.x](#)]
- 21 **Cyrany J**, Kopáčová M, Rejchrt S, Krajina A, Bureš J. Gastric arterial bleeding secondary to chronic occlusion of the splenic artery. *Folia Gastroenterol Hepatol* 2004; **2**: 92-98
- 22 **Cyrany J**, Kopacova M, Rejchrt S, Jirkovsky V, Al-Tashi M, Bures J. Gastric arterial bleeding secondary to chronic occlusion of the splenic artery (with video). *Gastrointest Endosc* 2010; **71**: 1335; author reply 1336 [PMID: [20598266](#) DOI: [10.1016/j.gie.2009.09.039](#)]
- 23 **Mnatzakanian G**, Smaggus A, Wang CS, Common AA, Jeejeebhoy KN. Splenic artery collaterals masquerading as gastric fundal varices on endoscopy: a sticky situation. *Gastrointest Endosc* 2008; **67**: 751-755 [PMID: [18206881](#) DOI: [10.1016/j.gie.2007.09.044](#)]
- 24 **Saddekni S**, Abdel-Aal AK, Oser RF, Underwood E, Bag A. Transcatheter embolization of extensive left gastric artery collaterals presenting with massive upper gastrointestinal bleed. *Vasc Endovascular Surg* 2012; **46**: 480-483 [PMID: [22669265](#) DOI: [10.1177/1538574412449908](#)]
- 25 **Al-Balas H**, Metwalli ZA, Sada DM. Chronic splenic artery occlusion with gastric wall arterial ectasia, an unusual cause of massive upper gastrointestinal hemorrhage. *BJR Case Rep* 2021; **7**: 20200194 [PMID: [34131504](#) DOI: [10.1259/bjrcr.20200194](#)]
- 26 **von Trotha KT**, Binnebösel M, Truong S, Behrendt FF, Wasmuth HE, Neumann UP, Jansen M. Severe gastric variceal haemorrhage due to splenic artery thrombosis and consecutive arterial bypass. *BMC Surg* 2011; **11**: 14 [PMID: [21711534](#) DOI: [10.1186/1471-2482-11-14](#)]

- 27 **Arslan S**, Onur MR, Akpınar E. A rare cause of upper gastrointestinal hemorrhage: chronic thrombosis of the splenic artery. *Turk J Gastroenterol* 2017; **28**: 221-222 [PMID: [28316323](#) DOI: [10.5152/tjg.2017.16745](#)]



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