

Case Report

Successful Treatment in Superior Mesenteric Artery Embolism: A Case Report and Literature Review

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The authors report a successful management of acute superior mesenteric artery embolism in a patient during the treatment of popliteal artery embolism. The diagnosis of this disease was confirmed by computerized tomographic angiography. Immediate surgical embolectomy and bowel resection were performed and postoperatively, he made an uneventful recovery except for minimal watery diarrhea for one week. In the present report the authors also review the in-patient records at Siriraj Hospital during 2005-2009 consisting of 14 cases with the claim diagnosis of this condition. Most of the patients developed peritonism on abdominal examinations showing a delay in diagnosis. The mortality rate was 86% (12 cases) which was higher than international reports. It is important to note that patients presenting with abdominal pain with underlying risk factors of arterial embolism is the clue in early diagnosis of this condition. CTA mesenteric artery is the most appropriate investigation to visualize the presence of embolism. Finally, immediate revascularization treatment is essential in the successful management of this fatal vascular problem.

Keywords: Superior mesenteric artery, Embolism, Embolectomy, Acute intestinal ischemia, Intestinal gangrene

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An embolus to the superior mesenteric artery (SMA) is a critical catastrophe requiring emergency management^(1, 2). The mortality of treatment ranged from 28% to 71%⁽³⁻⁶⁾. In Thailand, the mortality rate is rather higher and very few cases survived. The authors wish to report a successful treatment in a Thai patient with SMA embolism. It can be concluded that early diagnosis and immediate treatment are crucial in the management of this disease.

Case Report

A 72-year-old man was referred to the Department of Surgery Siriraj Hospital because of the sudden and progressive pain in the right leg for 3 days prior to the admission. He also had suffered from hypertension, dyslipidemia, atrial fibrillation and ischemic heart disease with the history of coronary artery bypass two years ago. His medications

included atenolol, enalapril maleate, isosorbide, aspirin and hydrochlorothiazide. He underwent surgical embolectomy of right popliteal artery due to acute embolism with severely ischemic lower extremity (Rutherford classification IIb).

Two days later, he was transferred to an intensive care unit due to hypotension and thrombocytopenia. The platelet count decreased from 183,000 to 85,000 per μ l. After heparin was discontinued, he had a severely acute abdominal pain and generalized tenderness on abdominal examinations. Computerized tomographic angiography (CTA) demonstrated the complete obliteration of superior mesenteric artery (SMA) at the level below the lower border of pancreas with preservation of the first jejunal branch (Fig. 1). Emergency laparotomy was carried out through a long midline incision. One hundred and fifty centimeters of gangrenous small intestine was found and resected. SMA was identified and encircled at the areas of duodeno-jejunal junction and lower border of pancreas. Embolus in SMA was completely removed with No. 3 balloon Fogarty catheter through a longitudinal arteriotomy (Fig. 2, 3). After proximal

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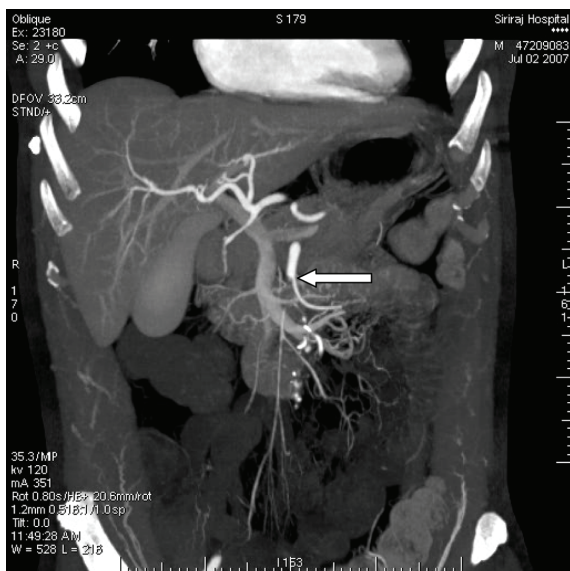


Fig. 1 CTA demonstrates the total occlusion of SMA just distal to the first jejunal branch with poor collateral circulation to the distal small intestine



Fig. 3 Embolus from superior mesenteric artery

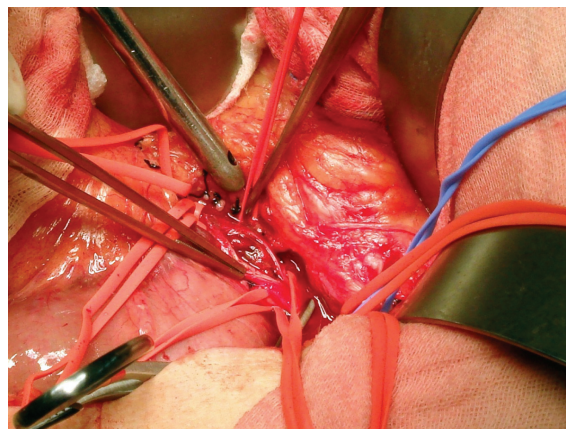


Fig. 2 A longitudinal arteriotomy at superior mesenteric artery demonstrates intraluminal embolus

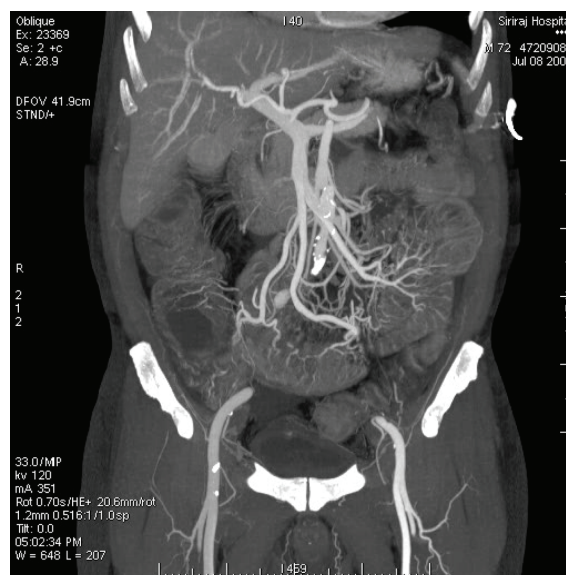


Fig. 4 CTA shows no residual emboli in SMA and normal blood flow to the remaining small intestine

and distal parts of SMA were infused with heparinized-saline solution, arteriotomy was closed with a vein patch. End to end anastomosis of the remaining small intestine was performed as the final part of the surgical procedure. Postoperatively, he had a minimal watery diarrhea for one week with rapid improvement. Postoperative CTA revealed no residual emboli in SMA and demonstrated good blood flow to small intestine (Fig. 4). In the meantime, the patient remains well with long term anticoagulant therapy. The follow-up time was 24 months.

Discussion

Similar to peripheral arterial embolism⁽⁷⁾, accurate diagnosis and appropriate treatment of SMA embolism at the early stage are the important factors determining the successful salvage of the reversible ischemic intestine to maintain the normal dietary life^(3,5). However, the treatment of this disease in Thai patients has been carried out in the late stage resulting in massive intestinal gangrene and high mortality. The reason is that most patients early presented with severe abdominal pain out of proportion to the clinical

findings. As a result, it was reluctant to consider this fatal condition and delay in management.

The criteria for the diagnosis of SMA embolism included suddenly severe abdominal pain⁽⁸⁾, previous history of peripheral arterial embolism^(5,9), associated with clinical risk factors of arterial embolism⁽⁸⁻¹⁰⁾, and mesenteric angiography demonstrating sharp, rounded filling defect in SMA distal to the first jejunal branch⁽¹¹⁾.

Theoretically, patients with SMA embolism should present with the abrupt onset of severe and continuous abdominal pain. However, only 30% of these patients had the characteristic of this abdominal symptom⁽⁸⁾. The severity of abdominal pain may vary from mild to severe as well as the pattern of abdominal pain may be either steady or crampy⁽¹²⁾, (Table 1). Vomiting and diarrhea, similar to gastroenteritis may also present ranging from 31% to 56%^(3,4).

Abdominal examinations may be normal at the early stage of SMA embolism with viable intestine^(13,14). In contrast, peritoneal signs can be detected when bowel ischemia progresses to infarction or perforation. Therefore, the severe persisting abdominal pain out of proportion to the abdominal findings may be the clinical criteria for the early detection of this disease^(4,5). Previous report has demonstrated that intestinal viability was maintained in all cases with the duration of symptoms of less than 12 hours whereas only 18% of patients with symptoms longer than 24 hours could maintain bowel viability⁽¹⁵⁾. This information indicates that the early diagnosis is significant for the successful result with intestinal salvageability. The presence of clinical risk factors of arterial embolism such as atrial fibrillation (28-79%), myocardial infarction (12.5-69%), valvular heart disease (3-66%) and previous arterial thromboembolism (5-44%) is another clue for the highly suspicious information for the diagnosis of SMA embolism (Table 1). The patients presenting with severe abdominal pain associated with these clinical risk factors should rapidly undergo the investigation for the definitive diagnosis and management of this disease.

Plain abdominal X-ray cannot be used for the diagnosis of an early stage of SMA embolism⁽¹⁶⁾, except showing pneumatosis intestinalis⁽¹¹⁾ and air in the portal venous system and liver in late stage⁽¹⁷⁾.

Conventional mesenteric angiography is the gold standard of investigation for the diagnosis of SMA embolism. In the meantime with the less invasive investigation, CTA mesenteric artery has an important

role in early diagnosis and treatment planning of this disease⁽¹⁸⁾. Additionally, it also demonstrates edematous bowel wall, stranding in the mesentery, portal venous gas and pneumatosis intestinalis in the vascular compromised intestine.

The principle treatment of SMA embolism includes the immediate revascularization of ischemic intestine by either surgical embolectomy or catheter-directed thrombolysis, the removal of gangrenous bowel, and the preservation of optimal length of viable intestine to maintain the normal dietary function.

Intensive fluid resuscitation, systemic heparinization and antibiotic administration are the requirements for the effective preoperative management. Although the timing of anticoagulant is controversial, this has been suggested that immediate heparin should be given if there is no sign of intestinal gangrene. Conversely, anticoagulation should be delayed when the peritoneal signs are present⁽⁵⁾.

Intraoperatively, the first step is to assess the extensive gangrene of intestine. The viable proximal jejunum should be detected because the patency of SMA proximal to the first jejunal branch is usually detected in this disease^(11,19). The most common revascularization procedure of SMA embolism is the surgical thromboembolectomy with Fogarty balloon catheter^(4,19). Arteriotomy should be done longitudinally to provide the adequate exposure for the removal of intraluminal embolus. The closure of arteriotomy should be done with or without vein patch depending on the friability of the arterial wall⁽²⁰⁾. Finally, the viability of intestine can be evaluated with inspection of the color and motility, pulsatility of jejunal and ileal arteries, and arterial flow signal of hand-held Doppler ultrasound⁽²¹⁾. Intravenous injection of fluorescein can be used in this assessment⁽²²⁾. Subsequently, the resection of the non-viable intestine and end to end anastomosis of the viable proximal and distal intestinal segments are performed. However, obviously gangrenous bowel should be resected prior to the revascularization to prevent reperfusion injury. Furthermore, the double enterostomy may be carried out in questionable viability of the remaining intestinal segment. The patients should undergo a second-look procedure at an interval of 48-72 hours to reassess the intestinal viability⁽⁹⁾. Approximately sixty centimeters of small intestine is required to sustain normal dietary function if the ileocecal valve is preserved⁽²³⁾. Therefore, whenever an extensive intestine gangrene exists, the abdomen should be closed without attempting further treatment⁽⁹⁾.

Table 1. Literature reviews and Siriraj experience of patients diagnosed with SMA embolism

Author	Year	Number	Risk factors			Abdominal characteristics	Investigation			Managements		Mortality rate
			AF	MI	VHD		Ang	CTA	DUS	Emb	CDT	
Batellier J ⁽⁵⁾	1990	82	79%	NS	NS	44%	Y	N	N	Y	N	28%
Bjorck M ⁽⁸⁾	2002	40	75%	12.5%	3%	5%	Y	Y	Y	Y	N	52%
Park WM ⁽⁴⁾	2002	16	50%	25%	NS	NS	Y	Y	Y	Y	Y	31%
Barakate MS ⁽²⁴⁾	2002	8	75%	NS	NS	NS	Y	Y	N	Y	Y	50%
Edwards MS ⁽⁹⁾	2003	32	28%	69%	NS	31%	Y	N	N	Y	N	50%
Bingol H ⁽¹⁰⁾	2004	24	NS	8%	66	NS	Y	N	N	Y	Y	21%
Kougias P ⁽³⁾	2007	24	46%	17%	NS	NS	Y	Y	Y	Y	N	28%
Siriraj series	2005-9	14	30%	26%	13%	13%	N	Y	N	Y	N	86%

AF = atrial fibrillation; MI = myocardial infarction; VHD = valvular heart disease; PPE = previous peripheral arterial embolism; NS = no specified; Y = yes; N = no; Ang = angiography; CTA = computer topography angiography; DUS = duplex ultrasonography; Emb = surgical embolectomy; CDT = catheter directed thrombolysis

Postoperatively, intensive monitoring and replacement therapy are required with optimization of cardiopulmonary status. The multiorgan failure is the most lethal complication resulting from a combination of bowel ischemia, sepsis and cardiovascular comorbidity^(3,4,9).

Catheter-directed thrombolysis is another therapeutic option for the early SMA embolism. The candidate patients must have stable vital signs and no peritoneal signs⁽²⁴⁾. This treatment is not applicable in this patient due to the evidence of hypotension and thrombocytopenia⁽²⁵⁾.

When ICD-10 codes as K 55.0 (subgroup: mesenteric artery embolism) were employed between 2005 and 2009 at Siriraj Hospital, the authors were able to retrieve 14 cases (12 males; mean age 71.35 years, range 39-88 years) diagnosed with SMA embolism (Table 1). The common risk factors were atrial fibrillation and myocardial infarction. The authors found that the mortality rate was 86% (12 cases) in the Siriraj series. The common causes of the high mortality rate compared with other series were delayed diagnosis (peritoneal signs 86%) and management. All dead patients presented with abdominal pain more than 24 hours and showed peritoneal signs on abdominal examination. There was another 68-year-old female patient who survived from this condition. She had underlying atrial fibrillation and valvular heart disease presented with abdominal pain less than 24 hours and generalized abdominal tenderness. The CTA demonstrated bowel gangrene and SMA embolism. She was rapidly operated with 150-centrimetre small bowel resection, right half colectomy and double enterostomy without surgical thromboembolism. Postoperatively, there was no further operation and she was discharged with double enterostomy.

In conclusion, acute abdominal pain out of proportion to the physical findings and the association with clinical risk factors of arterial embolism are the important clues for the early clinical diagnosis of SMA embolism. CTA mesenteric artery is the most appropriate investigation to visualize the presence of this disease. The immediate revascularization at the early stage of the disease provides the successful management of this emergency vascular problem.

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References

1. Safioleas MC, Moulakakis KG, Papavassiliou VG, Kontzoglou K, Kostakis A. Acute mesenteric ischaemia, a highly lethal disease with a devastating outcome. *Vasa* 2006; 35: 106-11.
2. Vahl AC, Gans RO, Mackaay AJ, van der Waal C, Rauwerda JA. Superior mesenteric artery occlusion and peripheral emboli caused by an aortic ulcer in a young patient with antiphospholipid syndrome. *Surgery* 1997; 121: 588-90.
3. Koungias P, Lau D, El Sayed HF, Zhou W, Huynh TT, Lin PH. Determinants of mortality and treatment outcome following surgical interventions for acute mesenteric ischemia. *J Vasc Surg* 2007; 46: 467-74.
4. Park WM, Gloviczki P, Cherry KJ Jr, Hallett JW Jr, Bower TC, Panneton JM, et al. Contemporary management of acute mesenteric ischemia: Factors associated with survival. *J Vasc Surg* 2002; 35: 445-52.
5. Batellier J, Kieny R. Superior mesenteric artery embolism: eighty-two cases. *Ann Vasc Surg* 1990; 4: 112-6.
6. Sitges-Serra A, Mas X, Roqueta F, Figueras J, Sanz F. Mesenteric infarction: an analysis of 83 patients with prognostic studies in 44 cases undergoing a massive small-bowel resection. *Br J Surg* 1988; 75: 544-8.
7. Mutirangura P, Ruangsetakit C, Wongwanit C, Sermsathanasawadi N, Chinsakchai K. Acute arterial embolism of the lower extremities: impact of 24-hour duration on the outcome of management. *J Med Assoc Thai* 2008; 91: 1360-7.
8. Bjorck M, Acosta S, Lindberg F, Troeng T, Bergqvist D. Revascularization of the superior mesenteric artery after acute thromboembolic occlusion. *Br J Surg* 2002; 89: 923-7.
9. Edwards MS, Cherr GS, Craven TE, Olsen AW, Plonk GW, Geary RL, et al. Acute occlusive mesenteric ischemia: surgical management and outcomes. *Ann Vasc Surg* 2003; 17: 72-9.
10. Bingol H, Zeybek N, Cingoz F, Yilmaz AT, Tatar H, Sen D. Surgical therapy for acute superior mesenteric artery embolism. *Am J Surg* 2004; 188: 68-70.
11. Martinez JP, Hogan GJ. Mesenteric ischemia. *Emerg Med Clin North Am* 2004; 22: 909-28.
12. Zuidema GD, Reed D, Turcotte JG, Fry WJ. Superior mesenteric artery embolectomy. *Ann Surg* 1964; 159: 548-53.
13. Hunter GC, Guernsey JM. Mesenteric ischemia. *Med Clin North Am* 1988; 72: 1091-115.

14. Lee WJ, Chang KJ, Hung CR, Chen KM. A case of acute superior mesenteric embolism successfully treated by embolectomy. Taiwan Yi Xue Hui Za Zhi 1989; 88: 176-8.
15. Lobo Martinez E, Merono Carvajosa E, Sacco O, Martinez Molina E. Embolectomy in mesenteric ischemia. Rev Esp Enferm Dig 1993; 83: 351-4.
16. Menon NJ, Amin AM, Mohammed A, Hamilton G. Acute mesenteric ischaemia. Acta Chir Belg 2005; 105: 344-54.
17. Yuksel O, Sare M, Salman B, Irkorucu O, Tezcaner T, Tascilar O, et al. Hepatic portal venous gas: a case report. Ulus Travma Acil Cerrahi Derg 2006; 12: 167-9.
18. Sato O, Okamoto H, Matsumoto H. Emergency CT scan for the diagnosis of superior mesenteric artery embolism. Report of 2 cases. Int Angiol 2003; 22: 438-40.
19. Ottinger LW. The surgical management of acute occlusion of the superior mesenteric artery. Ann Surg 1978; 188: 721-31.
20. Lazaro T, Sierra L, Gesto R, Villafana W, Fonseca J, Porto J, et al. Embolization of the mesenteric arteries: surgical treatment in twenty-three consecutive cases. Ann Vasc Surg 1986; 1: 311-5.
21. Hobson RW 2nd, Wright CB, Rich NM, Collins GJ Jr. Assessment of colonic ischemia during aortic surgery by Doppler ultrasound. J Surg Res 1976; 20: 231-5.
22. Bergman RT, Gloviczki P, Welch TJ, Naessens JM, Bower TC, Hallett JW Jr, et al. The role of intravenous fluorescein in the detection of colon ischemia during aortic reconstruction. Ann Vasc Surg 1992; 6: 74-9.
23. Thompson JS, Langnas AN, Pinch LW, Kaufman S, Quigley EM, Vanderhoof JA. Surgical approach to short-bowel syndrome. Experience in a population of 160 patients. Ann Surg 1995; 222: 600-5.
24. Barakate MS, Cappe I, Curtin A, Engel KD, Li-Kim-Moy J, Poon MS, et al. Management of acute superior mesenteric artery occlusion. ANZ J Surg 2002; 72: 25-9.
25. Moran KT, Jewell ER, Persson AV. The role of thrombolytic therapy in surgical practice. Br J Surg 1989; 76: 298-304.

การรักษาภาวะลำไส้เล็กเน่าตายจากลิ่มเลือดอุดตันในหลอดเลือดแดงสุพีเรีย มีเซนเทอริก ที่ได้ผลดี: รายงานผู้ป่วย 1 ราย

คามิน ชินศักดิ์ชัย, ชุมพล ว่องวานิช, เจนียน เรืองเศรษฐกิจ, ประมุข มุทิตางกูร

รายงานผลสำเร็จของการรักษาผู้ป่วยที่มีลิ่มเลือดอุดตันอย่างเฉียบพลันในหลอดเลือดแดงสุพีเรีย มีเซนเทอริก ซึ่งพบในผู้ป่วยในขณะรับการรักษาหลอดเลือดแดงของขาอุดตันเฉียบพลัน จากลิ่มเลือด โดยผู้ป่วยมีอาการปวดท้องอย่างรุนแรงการวินิจฉัยภาวะลิ่มเลือดอุดตันในหลอดเลือดแดงสุพีเรีย มีเซนเทอริกนี้ ยืนยันโดยผลตรวจจากเครื่องคอมพิวเตอร์ 3 มิติ ของระบบหลอดเลือดการทำผ่าตัดขจัดลิ่มเลือดอย่างเร่งด่วนสามารถแก้ไขภาวะขาดเลือดอย่างรุนแรงของลำไส้ และเก็บรักษาลำไส้ส่วนใหญ่ไว้ได้ ลำไส้ส่วนที่เน่าตายได้ทำการตัดออก และนำลำไส้ส่วนที่ปกติมาต่อเข้าหากัน ภายหลังการผ่าตัดผู้ป่วยฟื้นตัวได้เป็นอย่างดี การทบทวนเวชระเบียน ในภาควิชาศัลยศาสตร์ ระหว่างปี พ.ศ. 2548 ถึง พ.ศ. 2552 พบ 14 ราย ที่ได้รับการวินิจฉัยว่า เป็นลิ่มเลือดอุดตันอย่างเฉียบพลันในหลอดเลือดแดงสุพีเรีย มีเซนเทอริก ผู้ป่วยส่วนใหญ่มีภาวะหน้าท้องแข็งเกร็งจากการตรวจร่างกาย ซึ่งบ่งถึงการวินิจฉัยที่ล่าช้า อัตราตายพบ 86% ซึ่งสูงกว่าในการวิจัยของต่างประเทศ การวินิจฉัยโรคนี้ยังถูกต้องในระยะแรกโดยอาศัยลักษณะของอาการปวดท้องร่วมกับการมีปัจจัยเสี่ยงของการเกิดลิ่มเลือด, การตรวจวินิจฉัยโดยเครื่องคอมพิวเตอร์ 3 มิติของระบบหลอดเลือด และการรักษาอย่างมีประสิทธิภาพทันที เป็นสิ่งสำคัญในการรักษาผู้ป่วยโรคนี้ให้ประสบความสำเร็จ