

## CASE REPORT: PARTIAL OCCLUSION OF SUPERIOR MESENTERIC ARTERY WITH SEGMENTAL BOWEL INFARCTION

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An acute superior mesenteric artery (SMA) occlusion, which results in acute mesenteric ischemia, is a life-threatening event due to the obstruction of the arterial supply of the majority of the small bowel and right side of the colon. An acute occlusion is an uncommon event that typically affects elderly patients who are at increased risk of other cardiovascular events. Clinical presentation is variable and unfortunately often non-specific, which may cause the delay in diagnosis. It may be dramatic, with an acute onset of severe abdominal pain or not well-defined symptomatology.

A 56-year-old male worker was admitted to hospital because of central abdominal pain. The pain which started two days before was atypical and not corresponding to physical findings. This started around the umbilicus and was non-radiating and not related to meals. The pain was associated with two attacks of non-bloody diarrhoea with no mucus. There was no history of urinary symptoms, fever or weight loss. The patient was hypertensive, on beta blockers, had no history of surgery or allergy and had no special habits. Physical examination revealed no evidence of arrhythmia or heart failure. Physical examination was significant only for marked generalized abdominal distension, tenderness and rebound tenderness. There were decreased bowel sounds, no ascites or organomegaly. The plain abdominal x-ray was normal. Ultrasonography examination revealed marked distension of the colon, as well as decreased peristalsis. Multi-slice computed tomography angiography of the abdomen revealed incomplete thrombosis of the SMA with secondary enhancement and wall thickening of the distal ileum, caecum and part of the ascending colon secondary to partial arterial occlusion (thrombosis).

We recommend that whenever mesenteric ischemia is suspected computed tomography angiography should be done because the routine computed tomography examinations may miss focal mesenteric artery occlusion. Decreasing the time to diagnosis remains the only reliable means to decrease the morbidity and mortality associated with this disease. *Acta Medica Medianae* 2014;53(1):53-57.

**Key words:** acute mesenteric occlusion, angiography, intestinal ischaemia

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### Introduction

Acute mesenteric ischemia (AMI) represents a life-threatening abdominal condition (1). Despite medical advances, it has a high mortality rate (50%-90%) (2) depending on the cause of the event and the degree and extent of ischemic bowel wall damage (3). Most cases of acute intestinal ischemia result either from thrombosis of a preexisting stenotic lesion or from embolization (4) (most frequently to the SMA). Cardiac emboli are the most common variety, though

tumor emboli and atheroemboli are seen as well (5). Atheroemboli generally result from iatrogenically induced cholesterol embolization caused by aortic catheterization (6,7).

Computed tomography (CT) scan is a fast, widely available noninvasive modality that holds great promise for use in the diagnosis of AMI (8,9).

Mesenteric vascular occlusion is embolism or thrombosis of mesenteric blood vessels. It often has a clinical presentation of ileus, although there is no actual blockage. Etiologically, intestinal embolus may originate from the left atrium (atrial fibrillation), or mesenteric artery thrombosis is a result of atherosclerosis (10). Due to mesenteric vascular occlusion, the blood flow through the vessels is interrupted. Mesenteric and bowel infarction occurs with bleeding in the intestinal wall and lumen, as well as in the abdominal cavity. It develops gangrene soon and perforation of the intestinal ischemic gyrus. The blockage of the main tree of superior mesenteric

artery causes gangrene of the jejunum, ileum and the right half of the colon.

Characteristic triad of symptoms includes:

- abdominal pain,
- rectal bleeding,
- shock.

Clinical presentation is variable and unfortunately often non-specific causing the delay in diagnosis. It may be dramatic, with an acute onset of severe abdominal pain, or not well-defined (11). The abdomen is distended and painful to palpation, peristalsis is weakened and digital rectal examination for bleeding is positive.

Diagnosis is established by (12):

- clinical examination,
- ultrasonography (US),
- computed tomography (CT),
- magnetic resonance imaging (MRI).

CT is the most appropriate examination due to its speed, widespread availability and ability to diagnose other causes of acute abdominal pain (13,14). Findings in acute superior mesenteric artery occlusion include: bowel wall thickening, thickened wall may be present but does not correlate to severity and necrotic mural gas may be present (pneumatosis intestinalis). Ultrasound is able to demonstrate the normal flow in both SMA and SMV. However, it is incapable of assessing side branches or bowel wall. It has a small role in acute management of this condition.

An acute SMA occlusion has a mortality of over 60-80% despite treatment. Treatment options include (15):

- endovascular thrombectomy;
- intraluminal papaverine;
- surgical thrombectomy +/- resection of infarcted bowel.

We recommend that whenever mesenteric ischemia is suspected, CT angiography (16) should be requested because the routine CT examinations may miss focal mesenteric arterial ischemia. Decreasing the time to diagnosis remains the only reliable means to decrease the morbidity and mortality associated with this disease (17, 18).

At our hospital, multidetector row CT angiography, combined with appropriate post-processing techniques, has become the routine procedure for the diagnosis, evaluation, and treatment of suspected mesenteric ischemia.

### Case report

A 56-year-old male worker was admitted to hospital because of central abdominal pain. The pain had started two days before as atypical pain not corresponding to physical findings. It started around the umbilicus, was non-radiating or was not related to meals. It was associated with two attacks of non bloody diarrhoea with no mucus. There was no history of urinary symptoms, fever or weight loss. The patient was hypertensive on beta blockers, had no history of surgeries or

allergy, and had no special habits. Physical examination revealed no evidence of arrhythmia or heart failure. Physical examination was significant only for marked generalized abdominal distension, tenderness and rebound tenderness. There were decreased bowel sounds, no ascites or organomegaly. Rectal examination revealed an empty rectum with mild dark blood in the rectum. Blood results showed some abnormal findings; white blood cell count 18.5 thousand/ml, sodium 129 mmol/L, potassium 5 mmol/L and glycaemia 8.0 mmol/L. Urine examinations was positive for ketones and glucose. Chest X-ray revealed no air under the diaphragm or signs of intestinal obstruction. Plain X-ray of abdomen was normal. US examination revealed a marked distension of the colon with a paper-like wall, as well as weakened peristalsis (Figure 1).

There was no any free fluid in the abdomen. Clinicians requested CT angiography (Siemens Emotion 16,Fly,DE, Germany) of the abdomen which showed moderate distension and wall thickening of distal ileum, caecum and part of ascending colon. However, analysis showed a partial occlusion of the superior mesenteric artery (SMA) with distal intestinal ischemia, secondary enhancement and wall thickening of the distal ileum, caecum and part of ascending colon secondary to arterial occlusion (thrombosis) (Figure 2,3).

After CT diagnosis, patient had a surgery confirming mesenterial ischaemia.

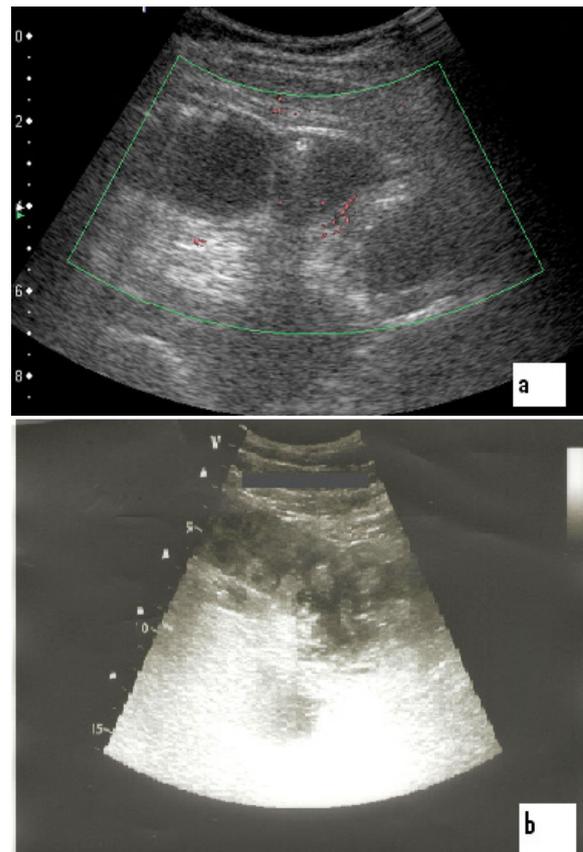


Figure 1. US of abdomen (a,b) shows marked distension of the colon with wall like a paper



Figure 2. Enhanced abdominal CT scan demonstrates a filling defect in the superior mesenteric artery; enhancement of small bowel wall also present throughout



Figure 3. Abdominal CT Angio-coronal reconstructed image revealed marked discrepancy of the bowel wall enhancement between the distal ileum and right colon, and the proximal ileum and left colon, confirming arterial ischemia

## Discussion

AMI accounts for 60% to 80% of all cases of mesenteric ischemia and has a mortality rate between 59% and 93% (2). AMI may be caused by arterial emboli, arterial or venous thrombosis and non-occlusive obstruction (3). In all causes, the sudden onset of intestinal hypoperfusion can lead to hypoxemia and intestinal hypoxia with irreversible bowel damage (5,6). Risk factors for developing AMI depend on the etiology. More often, patients are older than 50 years and suffer from congestive heart failure, recent myocardial infarction, hypovolemia, hypotension or sepsis. Clinical presentation is non-specific. The absence of specific signs upon physical examination can make the diagnosis of AMI very challenging and the clinical consequences of missed AMI can be catastrophic. Physical findings are usually both non-specific and unremarkable and pain is frequently out of proportion to the objective findings on investigation. Sometimes, a bruit can be heard over the epigastric region.

A rapid diagnosis is the most important factor for prognosis, and urgent investigation of vessel patency should be thus done by abdominal CT (6-8,10). During the work-up, the patient should be closely monitored and stabilized. Once the diagnosis has been made, ischemic bowel segments should be resected and the blood flow restored as soon as possible. Depending on the etiology of the acute ischemia, the restoration of blood flow can be achieved either surgically, using intra-arterial vasodilatation, embolectomy or bypass, or via medical revascularization with, for example, intravenous heparin.

In this case, there was some confusion about the true etiology. There was a discrepancy between symptomatology and sitophobia suggesting AMI. No reasonable explanation could be found for the symptoms.

The nature of spiral CT and the modality of reconstruction result in a massive number of axial sections being obtained (300–800 sections, depending on the scanner and the reconstruction parameters). Postprocessing tools are mandatory for handling and reviewing this huge amount of data. There are two possible approaches at this level. The first approach is based on the interaction of the radiologist with the data set using the full range of postprocessing tools; the second approach is based on standardization of the protocol to limit interaction with the data set to the targeted problem-solving task. The first approach is more accurate and comprehensive but also more time-consuming. The second approach has several advantages and relies on the ability of the technician to provide high-quality preprocessed material.

At our hospital, multi-detector row CT - MDCT angiography with 16-slice scanners, combined with appropriate postprocessing techniques, has become the routine procedure for the diagnosis, evaluation, and treatment of suspected AMI. MDCT angiography can be routinely performed as an outpatient procedure at a lower cost and with less risk and patient discomfort.

In our experience, the vessel lumen and vessel stenosis are better visualized with MDCT angiography. Any projection or plane can be created to evaluate the degree of stenosis and the anatomic configuration of the vessel.

## Conclusion

CT angiography is the "gold standard" for the diagnosis of clinically non-specific mesenteric occlusion. Contrast-enhanced CT can show occlusion of SMA, frequently accompanied with severe stenosis of the celiac artery, and findings suggestive of bowel ischemia, including pneumatosis intestinalis, bowel wall thickening, ileus, and bowel dilatation. Angiography can define the location and origin of the arterial occlusion and provide the potential for intervention if mesenteric ischemia is diagnosed prior to ischemic bowel necrosis. An area of transmural bowel

necrosis in AMI can appear within 15 min after the onset and after 6h, and irreversible gangrene of the affected segments may ensue.

We recommend that whenever mesenteric ischemia is suspected, dual phase contrast

enhanced MSCT should be done because of arterial and portal venous phase. The routine contrast enhanced CT examinations in portal venous phase may miss focal mesenteric artery occlusion.

## References

- Berland T, Oldenburg WA. Acute mesenteric ischemia. *Curr Gastroenterol Rep* 2008; 10:341-6. [\[CrossRef\]](#) [\[PubMed\]](#)
- Kassahun WT, Schulz T, Richter O, Hauss J. Unchanged high mortality rates from acute occlusive intestinal ischemia: Six year review, Langenbecks Arch Surg 2008; 393:163-71. [\[CrossRef\]](#) [\[PubMed\]](#)
- Ujiki M, Kibbe MR. Mesenteric ischemia. *Perspect Vasc Surg Endovasc Ther* 2005; 17:309-18. [\[PubMed\]](#)
- Acosta S, Bjorck M. Acute thrombo-embolic occlusion of the superior mesenteric artery: A prospective study in a well defined population. *Eur J Vasc Endovasc Surg* 2003; 26:179-83. [\[CrossRef\]](#) [\[PubMed\]](#)
- Acosta S, Ogren M, Sternby NH, Bergqvist D, Bjorck M. Incidence of acute thrombo-embolic occlusion of the superior mesenteric artery-A population-based study. *Eur J Vasc Endovasc Surg* 2004; 27:145-50. [\[CrossRef\]](#) [\[PubMed\]](#)
- Khan JF, Bhuiyan SMA, Adhami RR. Image segmentation and shape analysis for road-sign detection. *Intelligent Transportation Systems* 2011; 12:83-96. [\[CrossRef\]](#)
- Fleischmann D. Multiple detector-row CT angiography of the renal and mesenteric vessels. *Eur J Radiol* 2003; 45:S79-S87. [\[CrossRef\]](#) [\[PubMed\]](#)
- Alpern MB, Glazer GM, Francis IR. Ischemic or infarcted bowel: CT findings. *Radiology* 1988; 166: 149-52. [\[PubMed\]](#)
- Horton KM, Fishman EK. Multidetector CT angiography in the diagnosis of mesenteric ischemia. *Radiol Clin North Am* 2007; 45:275-88. [\[CrossRef\]](#) [\[PubMed\]](#)
- Zandrino F, Musante F, Gallesio I, Benzi L. Assessment of patients with acute mesenteric ischemia: Multislice computed tomography signs and clinical performance in a group of patients with surgical correlation. *Minerva Gastroenterol Dietol* 2006; 52: 317-25. [\[PubMed\]](#)
- Aschoff AJ, Stuber G, Becker BW, Hoffmann MH, Schmitz BL, Schelzig H, et al. Evaluation of acute mesenteric ischemia: Accuracy of biphasic mesenteric multi-detector CT angiography. *Abdom Imaging* 2009; 34:345-57. [\[CrossRef\]](#) [\[PubMed\]](#)
- 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. [\[CrossRef\]](#) [\[PubMed\]](#)
- Furukawa A, Kanasaki S, Kono N, Wakamiya M, Tanaka T, Takahashi M, et al. CT diagnosis of acute mesenteric ischemia from various causes. *AJR Am J Roentgenol* 2009; 192: 408-16. [\[CrossRef\]](#) [\[PubMed\]](#)
- Taylor LM, Moneta GL, Porter JM. Treatment of acute intestinal ischemia caused by arterial occlusions. In: *Rutherford Vascular Surgery*. 5th edition. Philadelphia: WB Saunders Co; 2000. p. 1512-8. [\[CrossRef\]](#) [\[PubMed\]](#)
- Cademartiri F, van der Lugt A, Luccichenti G, Pavone P, Krestin GP. Parameters affecting bolus geometry in CTA: a review. *J Comput Assist Tomogr* 2002; 26:598-607. [\[CrossRef\]](#) [\[PubMed\]](#)
- Hata J, Kamada T, Haruma K, Kusunoki H. Evaluation of Bowel Ischemia with Contrast-enhanced US: Initial Experience. *Radiology* 2005; 236:712-5. [\[CrossRef\]](#) [\[PubMed\]](#)
- Lee R, Tung HKS, Tung PHM, Cheung SCW, Chan FL. CT in acute mesenteric ischaemia. *Clin Radiol* 2003; 58:279-87. [\[CrossRef\]](#)
- Laghi A, Iannaccone R, Catalano C, Passariello R. Multislice spiral computed tomography angiography of mesenteric arteries. *Lancet* 2001; 358:638-9. [\[CrossRef\]](#) [\[PubMed\]](#)
- Kirkpatrick ID, Kroeker MA, Greenberg HM. Biphasic CT with Mesenteric CT angiography in the evaluation of acute mesenteric ischemia: initial experience. *Radiology* 2003; 229:91-8. [\[CrossRef\]](#) [\[PubMed\]](#)

## PRIKAZ BOLESNIKA: PARCIJALNA OKLUZIJA GORNJE MEZENTERIČNE ARTERIJE SA SEGMENTNOM CREVNOM ISHEMIJOM

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Akutna mezenterijalna vaskularna okluzija predstavlja emboliju ili trombozu mezenterijalnih krvnih sudova. Uzrokuje sliku ileusa, iako nema stvarnog začepjenja crevnog lumena. Mezenterijalna arterijska tromboza najčešće je posledica ateroskleroze. Sama arterija iriguje većinu tankog creva i desne strane debelog creva. Klinička prezentacija je varijabilna, nekad i nespecifična. Može biti dramatična sa anginoznim bolovima u stomaku ili sa manje definisanom simptomatologijom.

Prezentacija slučaja: muškarac star 56 godina primljen je u bolnicu zbog bolova u stomaku u predelu umbilikusa. Bol je počeo dva dana ranije, atipičan u odnosu na fizikalni nalaz. Bol počinje periumbilikalno. Ovaj bol se ne širi, niti je bio postprandijalan. Posle prijema, sledila su još dva napada dijarealnih stolica bez prisustva krvi i sluzi. Nije bilo istorije urinarnih simptoma, groznice, niti gubitka telesne težine. Bolesnik je bio na antihipertenzivnoj terapiji beta blokatorom. Nije imao operacije i alergijske reakcije, niti posebne navike. Pregled je isključio postojanje aritmije i srčane insuficijencije, uz prisutnu distenziju trbuha. Crevna peristaltika je bila prisutna, ali znatno oslabljena. Nativna radiografija abdomena bila je uredna. Ultrazvučni pregled je pokazao izrazitu distenziju kolona, oslabljenu peristaltiku, kao i edem tenkocrevnih vijuga. MSCT angiografija abdomena pokazala je parcijalnu okluziju proksimalnog dela gornje mezenterične arterije sa umerenom distenzijom i zadebljenjem zida distalnog ileuma, cekuma i dela ascendentnog kolona.

Kod mezenterijalne okluzije CT angiografija je zlatni standard, jer rutinski CT pregled ne može uvek dokazati fokalnu okluziju mezenterijalnih krvnih sudova. Brža dijagnoza ostaje jedini pouzdan način za smanjenje morbiditeta i mortaliteta od ovog entiteta. *Acta Medica Medianae 2014;53(1):53-57.*

***Ključne reči:*** akutna mesenterijalna okluzija, angiografija, crevna ishemija