Management approach for mesenteric artery syndrome in the emergency department

Hassan Mohammed AL madan, Abdulaziz Hassan Al Safwan, Ahmed mohammed khan, Fatimah Abdullah Jaber Alquraish

Abstract:

In this review we discuss symptoms, diagnostic approach and highlight management methods in emergency department of mesenteric artery syndrome. We conducted a search using electronic databases; MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trials (CENTRAL), through December, 2017. Search strategies used following MeSH terms in searching via these databases: “mesenteric artery syndrome”, “emergency department”, “Management”, “Treatment”. Superior mesenteric artery syndrome is an unusual cause of proximal small bowel blockage that may be detected in the ED. Emergency doctors should include SMA syndrome in the differential medical diagnosis for abdominal pain and throwing up in individuals with particular predisposing factors, such as rapid weight loss. Early CT scanning can be diagnostic as well as useful to assess for prospective surgical complications. Instituting early helpful treatment and correction of precipitating aspects improves patient outcomes; therefore, considering this uncommon entity in the differential medical diagnosis of abdominal pain is useful. Surgical intervention is indicated when conservative measures are inefficient,

particularly in patients with a long history of progressive weight loss, pronounced duodenal dilatation with stasis, and complicating peptic ulcer illness.

Introduction:

The superior mesenteric artery syndrome (SMAS) is rare. Nonetheless, it is a harmful condition which happens when the abdominal aorta and the superior mesenteric artery compress the distal part of the duodenum. It was first described in 1842 by the Austrian doctor Rokitansky. The SMAS shows up after spine surgical treatments or surgical therapy of scoliosis. The rate of the SMAS differs from 0.5 to 2.4% [1].

The superior mesenteric artery (SMA) increases from the anterior surface area of the abdominal aorta, simply inferior to the beginning of the celiac trunk at the level of L1 or L2 vertebra. It is covered in adipose and lymphatic tissue; at first it travels in an anterior/inferior direction and gets in the small intestine tether.The suggest angle between the abdominal aorta and the SMA is from 38 to 56 degrees, and the distance in between these blood vessels is from 10 to 28 mm [2].The SMAS shows up as a result of the reduced aortomesenteric angle (6 to 16 levels and distance from 2 to 8 mm) [2].

The SMAS can be triggered by: quick body mass loss, some metabolic conditions which decreases mesenteric and retroperitoneal adiposal tissue quantity, trauma, high anchoring of Treitz ligament, low anchoring of the mesenteric artery, a high-degree lumbar lordosis, neoplastic masses near SMA radix, a dividing aortic aneurysm and some kinds of surgeries [3].A surgical correction of scoliosis is among one of the most typical reasons of the SMAS. An asthenic body make-up, kyphosis in the sagittal plane, a reduced body mass index, loss of body mass after surgery are danger variables for the creating SMAS after a surgical therapy of scoliosis [1],

[4].Earlier research studies revealed that if the percentiles of the weight in relation to sex and age are less than 25, then the risk of developing SMAS is greater [5].

Additionally, the adjustments in spine curvature in coronary and sagittal aircrafts play an important role in the SMAS advancement. A greater modification creates a boost in the patient's height. Additionally, an older research reveals that flexibility of the kyphotic curvature, the degree of scoliosis and spine equilibrium are very vital prognostic variables for developing the SMAS. A surgical adjustment of scoliosis substantially lengthens the spine and enhances external compression of the distal duodenum as the distal duodenum experiences a tapered angle which is developed of the aorta, the anterior wall of the spinal column, and the posterior wall of the superior mesenteric artery. As a result of scoliosis modification surgery, lateral mobility of the SMA is reduced therefore the aorto-mesenteric angle is altered. It is observed that the prolongation of the spinal column, especially in the back area, after the surgery is an essential danger aspect for establishing the SMAS [4], [6].

In this review we discuss symptoms, diagnostic approach and highlight management methods in emergency department of mesenteric artery syndrome.

Methodology:

We conducted a search using electronic databases; MEDLINE, EMBASE, and Cochrane Central Register of Controlled Trials (CENTRAL), through December, 2017. Search strategies used following MeSH terms in searching via these databases: “mesenteric artery syndrome”, “emergency department”, “Management”, “Treatment”. Then we also searched the

bibliographies of included studies for further relevant references to our review.

Discussion:

- **Symptoms**

Patients with the SMAS generally complain of acute or chronic (relying on the etiology of the SMAS or the degree of duodenum compression) abdominal pain. In both cases, there is a proximal little intestine obstruction. Patients with mild obstruction complain of pain in the epigastric region and very early feeling of fullness after dishes, whereas if the obstruction is extreme patients complain of vomiting, throwing up bile and shedding body mass that can not be explained by any type of various other reasons [7], [8].Throughout a checkup such non-specific findings as abdominal tenderness and high frequency instestinal noises can be observed. Lam et al. research study described 14 patients with SMAS signs and reviewed their significance (Table 1) [9].Results of laboratory tests are usually within the typical ranges, just in cases with serious vomiting a disbalance of electrolytes may be seen. Abdominal pain is just one of one of the most usual problems of the patients who undertook surgical treatment of scoliosis. If the SMAS occurs, it normally establishes one week after the surgery [1], [10].

Table 1. Symptoms of the SMAS

Symptoms	Number of patients (%)
Any type of vomiting	13 (92.9)
Abdominal pain/sensitivity	8 (57.1)
Abdominal tenderness	6 (42.9)
Vomiting bile	5 (35.7)
Hypoactive peristaltic movement	4 (28.6)
Anorexia	3 (21.4)

- **Diagnosis**

Patients with a suspected SMAS should be thoroughly examined utilizing radiographic tests to validate or leave out the diagnosis. Computed tomography (CT), CT angiography, magnetic resonance imaging (MRI), MRI angiography, conventional angiography, sonoscopy and endoscopic diagnostic examinations are utilized to diagnose the SMAS [11], [12].In the past, angiography was the gold standard for measuring the aortomesenteric angle and the range between these two vessels. The traditional diagnostic examination with barium still plays an essential function in the diagnostics of the SMAS and it can be used to imagine the common, but non-specific image: the dilated proximal duodenum with break-up of barium in the distal third of the duodenum [13].In several studies, strict radiological criteria were released: dilatation of the first and second thirds of the duodenum with or without dilatation of the stomach, vertical or oblique compression of mucosal ridges, an antiperistaltic comparison flow in the direction of the obstruction, evacuation of the comparison from the gastroduodenal area prolonged by 4-6 hours [14].

The aortomesenteric angle, the distance in between the abdominal aorta and the SMA, the adiposal tissue, the obstruction of the duodenum and a feasible root cause of compression could be seen in CT images. Additionally, CT might be utilized to exclude various other pathologies and illness, to visualize the dilation of the duodenum, the anatomy of the SMA and its relation with various other blood vessels. Lippl et al. have discovered that CT with comparison and MRI angiography are equally helpful for evaluating the aortomesenteric angle and range [11].As these tests are non-invasive and can give a lot of anatomical information, nowadays they are taken into

consideration to be one of the most valuable examinations for diagnosing the SMAS. Now, the diagnostic criteria of the SMAS are the following:

- An obstruction of the duodenum with active peristalsis and sudden break-up of comparison in the distal third of the duodenum

- The aortomesenteric angle much less than 25 degrees (it is one of the most sensitive factor, specifically if the aortomesenteric distance is less compared to 8 mm or there is high anchoring of Treitz ligament or low setting of the SMA) [2], [12].

A sonoscopy with a dopler can be utilized to locate a decreased aortomesenteric angle [2].Additionally, during this test the position of the patient might be changed as it could help to identify any kind of modifications of the aortomesenteric angle while transforming body positions [12].Furthermore, an endoscopy of the upper gastrointestinal system can assist to remove an intestinal blockage, a gastric or duodenal ulcer, all of which might manifestat as symptoms similar to the SMAS.

- **Management**

Treatment of the SMAS is usually begun with conservative means. The main principles for treating the SMAS are: rehidration, removal of obstruction, and maintenance of an optimal body weight. If the progression of the symptoms is sudden, a nasogastric tube for gastric and duodenum decompression, positioning of the patient (on abdomen or left side of the body with knees bend to chest) can be an effective part of therapy [14].The described certain compulsory placement releases tension on the SMA and increases the area in between the aorta and the SMA. It is required to recover the balance of fluids and electrolytes as excessive throwing up can be the reason for hypovolemia, hypokalemia, or also metabolic alcalosis. Additionally, enteral or parenteral nutrition is needed to keep and raise the body mass. It is essential, due to the fact that

the rise of the retroperitonial adiposal tissue enhances the aortomesenteric angle. Enteral nutrition with a nasogastric tube situated distally to the obstruction website is favored. A recent research revealed a favorable reaction to non-surgical therapy as signs of 86% of the patients boosted [7].The majority of the patients with the SMAS that created after surgical treatment of scoliosis made a full recovery after conservative treatment [1].

When signs do not enhance while managing conservatively, surgical therapy is recommended [15], [16].Surgical therapy of the SMAS entails: gastrojejunostomy, duodenojejunostomy, lysis of Treitz ligament, or the surgical method of Strong. Formerly, open duodejejunostomy was the gold requirement as it was then the most effective and the safest surgical treatment. Nevertheless, there is an also much better alternative nowadays- a minimally invasive laparoscopic duodenojejunostomy [17]. Gastrojejunostomy ensures adequate decompression yet the blockage is not constantly eliminated. Consequently, the signs and symptoms could persist because the obstruction could create abscess and bile reflux. During Strong's surgery, Treitz ligament is divided, then the transverse and ascendant parts of the duodenum are set in motion. The duodenum is drawn to the right of side of the SMA. Nevertheless, if there many adhesions the procedure ends up being extremely difficult or even difficult to perform.

Due to a high danger of difficulties and relatively high mortality, it is crucial to assess threat elements for the establishing SMAS and to detect or leave out the diagnosis of the SMAS asap. Because lots of medical professionals are not conscious of this syndrome due to its rarity, the SMAS is diagnosed after an extended period of time while a patient is dealing with stomach discomfort or discomfort. Late diagnosis could end in complications: fatality as a result of the disbalance of electrolytes, a perforation of the stomach, gastric pneumatosis or obstruction created by duodenum benzoar. As a result of the rarity of the SMAS and its non-specific symptoms, diagnostics of this disorder is a really big analysis obstacle for physicians. For that

reason, to much better understand the danger elements of the SMAS and to promote diagnostics, we provide a recent medical circumstance throughout which the SMAS developed after the surgical therapy of neuromuscular scoliosis.

- **Surgery for mesenteric artery syndrome**

Surgical treatment is shown when conservative measures are inadequate, especially in patients with a long background of progressive weight-loss, articulated duodenal dilatation with tension, and complicating peptic ulcer condition. A test of conservative therapy should be set up for at least 4-6 weeks before surgical intervention.

Choices for surgery include a duodenojejunostomy or gastrojejunostomy to bypass the obstruction or a duodenal derotation procedure (otherwise called the Strong treatment) to alter the aortomesenteric angle and location the third and fourth sections of the duodenum to the right of the remarkable mesenteric artery [18].This is called derotation because the last placement of the midgut remains in direction opposition to the typical beginning rotation of the midgut. This could be best suited for pediatric patients in whom the premium mesenteric artery syndrome could be associated with congenital anatomic problems that predispose to their symptomatology [18].

Surgical duodenal derotation for remarkable mesenteric artery syndrome generally calls for a laparotomy, throughout which the duodenum is activated after department of the ligament of Treitz. Once the duodenojejunal junction has been totally mobilized, the jejunum is passed behind the exceptional mesenteric artery and is positioned to the right of the exceptional mesenteric artery so it does not hinge on the acute angle in between the aorta and the premium mesenteric artery [18], [19].This treatment could likewise be done laparoscopically and could be converted to a gastrojejunostomy or duodenojejunostomy if it cannot improve the patient's symptoms.

An additional surgical approach to dealing with superior mesenteric artery disorder is a duodenojejunostomy, where the pressed portion of the duodenum is launched and an anastomosis is produced between the duodenum and jejunum former to the exceptional mesenteric artery. This is the timeless strategy to exceptional mesenteric artery syndrome. Benefits consist of the simplicity of procedure. Difficulties include threat of blood loss, leakage or stricture at the anastomotic site, and a production of a nonphysiologic bilious circulation loop of unidentified consequence [18].

Successful laparoscopic duodenojejunal bypass has been defined. The procedure contains a loop of jejunum anastomosed to the expanded duodenal sector, which is seen listed below the transverse mesocolon. Although experience is restricted to situation records and little studies, laparoscopic approaches are possible and offer a much less invasive surgical alternative [20], [21].A gastrojejunostomy may be another surgical option yet is usually reserved for patients that have contraindication to a duodenojejunostomy, such as duodenal ulcer condition or if both the belly and duodenum are drastically expanded [18].Care in pursuing surgical modification must be taken in patients with considerable premorbid problems and malnutrition, such as end-stage renal illness, due to the fact that these have a high surgical death when carried out for exceptional mesenteric artery disorder [22].

A retrospective research study reviewed 12 patients with superior mesenteric artery syndrome who were treated with laparoscopic enteric bypass. The research wrapped up that laparoscopic duodenojejunostomy is safe and effective and ought to be thought about the optimal treatment for patients presenting with duodenal obstruction from superior mesenteric artery syndrome. The study additionally ended that advancements in minimally invasive surgery have shown the security and low morbidity of laparoscopically developed enteric anastomoses. The authors add that the much shorter medical facility remain, reduced morbidity, which the high success of

laparoscopic enteric bypass make this method positive to traditional open methods [23], [24].A retrospective chart testimonial by Chang et alia on patients who underwent minimally invasive duodenojejunostomy found that at follow-up just 6 of 18 patients reported symptomatic improvement or resolution despite the fact that 14 of 18 patients reported preliminary sign improvement [25].

Conclusion:

Superior mesenteric artery syndrome is an unusual cause of proximal small bowel blockage that may be detected in the ED. Emergency doctors should include SMA syndrome in the differential medical diagnosis for abdominal pain and throwing up in individuals with particular predisposing factors, such as rapid weight loss. Early CT scanning can be diagnostic as well as useful to assess for prospective surgical complications. Instituting early helpful treatment and correction of precipitating aspects improves patient outcomes; therefore, considering this uncommon entity in the differential medical diagnosis of abdominal pain is useful. Surgical intervention is indicated when conservative measures are inefficient, particularly in patients with a long history of progressive weight loss, pronounced duodenal dilatation with stasis, and complicating peptic ulcer illness. A trial of conservative treatment need to be instituted for at least 4-6 weeks prior to surgical treatment.

Reference:

1. Altiok H, Lubicky JP, DeWald CJ, Herman JE. The superior mesenteric artery syndrome in patients with spinal deformity. Spine. 2005. October 1; 30(19): 2164–70.
2. Neri S, Signorelli SS, Mondati E, Pulvirenti D, Campanile E, Di Pino L. et al. Ultrasound imaging in diagnosis of superior mesenteric artery syndrome. J Intern Med. 2005. April; 257(4): 346–51.
3. Welsch T, Büchler MW, Kienle P. Recalling Superior Mesenteric Artery Syndrome. Dig Surg. 2007; 24(3): 149–56.
4. Shah MA, Albright MB, Vogt MT, Moreland MS. Superior mesenteric artery syndrome in scoliosis surgery: weight percentile for height as an indicator of risk. J Pediatr Orthop. 2003. October; 23(5): 665–8.
5. Braun SV, Hedden DM, Howard AW. Superior mesenteric artery syndrome following spinal deformity correction. J Bone Joint Surg Am. 2006. October; 88(10): 2252–7.
6. Crowther MAA, Webb PJ, Eyre-Brook IA. Superior mesenteric artery syndrome following surgery for scoliosis. Spine. 2002. December 15; 27(24): E528–33.
7. Biank V, Werlin S. Superior mesenteric artery syndrome in children: a 20-year experience. J Pediatr Gastroenterol Nutr. 2006. May; 42(5): 522–5.
8. Cohen LB Field SP Sachar DB. The superior mesenteric artery syndrome. The disease that isn't, or is it? J Clin Gastroenterol. 1985. April; 7(2): 113–6.
9. Lam DJL, Lee JZJ, Chua JHY, Lee YT, Lim KBL. Superior mesenteric artery syndrome following surgery for adolescent idiopathic scoliosis: a case series, review of the literature, and an algorithm for management. J Pediatr Orthop B. 2014. July; 23(4): 312–8.
10. Hod-Feins R, Copeliovitch L, Abu-Kishk I, Eshel G, Lotan G, Shalmon E. et al. Superior mesenteric artery syndrome after scoliosis repair surgery: a case study and reassessment of the syndrome's pathogenesis. J Pediatr Orthop Part B. 2007. September; 16(5): 345–9.
11. Lippl F, Hannig C, Weiss W, Allescher H-D, Classen M, Kurjak M. Superior mesenteric artery syndrome: diagnosis and treatment from the gastroenterologist's view. J Gastroenterol. 2002; 37(8): 640–3.
12. Unal B, Aktaş A, Kemal G, Bilgili Y, Güliter S, Daphan C. et al. Superior mesenteric artery syndrome: CT and ultrasonography findings. Diagn Interv Radiol Ank Turk. 2005. June; 11(2): 90–5.
13. Girotra M, Shah HR, Rego RF. An intriguing cause of intractable nausea and vomiting. Saudi J Gastroenterol Off J Saudi Gastroenterol Assoc. 2013. August; 19(4): 190–1.
14. Dietz UA, Debus ES, Heuko-Valiati L, Valiati W, Friesen A, Fuchs KH. et al. [Aorto-mesenteric artery compression syndrome] . Chir Z Für Alle Geb Oper Medizen. 2000. November; 71(11): 1345–51. German.
15. Shiyanagi S, Kaneyama K, Okazaki T, Lane GJ, Yamataka A. Anterior transposition of the third part of the duodenum for the treatment of superior mesenteric artery syndrome. J Pediatr Surg. 2008. February; 43(2): e1–3.

16. Okugawa Y, Inoue M, Uchida K, Kawamoto A, Koike Y, Yasuda H. et al. Superior mesenteric artery syndrome in an infant: case report and literature review. J Pediatr Surg. 2007. October; 42(10): E5–8.
17. Singaporewalla RM, Lomato D, Ti TK. Laparoscopic duodenojejunostomy for superior mesenteric artery syndrome. JSLS J Soc Laparoendosc Surg Soc Laparoendosc Surg. 2009. September; 13(3): 450–4.
18. Ha CD, Alvear DT, Leber DC. Duodenal derotation as an effective treatment of superior mesenteric artery syndrome: a thirty-three year experience. Am Surg. 2008 Jul. 74(7):644-53.
19. Wilson-Storey D, MacKinlay GA. The superior mesenteric artery syndrome. J R Coll Surg Edinb. 1986 Jun. 31(3):175-8.
20. Richardson WS, Surowiec WJ. Laparoscopic repair of superior mesenteric artery syndrome. Am J Surg. 2001 Apr. 181(4):377-8.
21. Bermas H, Fenoglio ME. Laparoscopic management of superior mesenteric artery syndrome. JSLS. 2003 Apr-Jun. 7(2):151-3.
22. Yap DY, Ma MK, Lai AS, et al. Superior mesenteric artery syndrome complicating dialysis patients with peritoneal failure--report of 3 cases. Clin Nephrol. 2011 Feb. 75 Suppl 1:37-41.
23. Pottorf BJ, Husain FA, Hollis HW Jr, Lin E. Laparoscopic management of duodenal obstruction resulting from superior mesenteric artery syndrome. JAMA Surg. 2014 Dec. 149 (12):1319-22.
24. Boggs W. Laparoscopic Management Effective for Duodenal Obstruction Resulting From Superior Mesenteric Artery Syndrome. Reuters Health Information. Available at http://www.medscape.com/viewarticle/834592. November 10, 2014; Accessed: July 28, 2015.
25. Chang J, Boules M, Rodriguez J, Walsh M, Rosenthal R, Kroh M. Laparoscopic duodenojejunostomy for superior mesenteric artery syndrome: intermediate follow-up results and a review of the literature. Surg Endosc. 2016 Jul 12.