ORIGINAL ARTICLE
นิพนธ์ต้นฉบับ

Superior Mesenteric Artery Syndrome caused by the correction of Idiopathic Scoliosis

Paisarn Vejchapipat
Soottiporn Chittmittrapap

Paisarn Vejchapipat, Soottiporn Chittmittrapap. Superior Mesenteric Artery Syndrome caused by the correction of Idiopathic Scoliosis. Thai J Surg 1996 ; 17(4) : 173-179

Objective : To review and present 2 rare cases of Superior Mesenteric Artery Syndrome

Setting : Division of Pediatric Surgery, Department of Surgery, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Design : Cases review and review article

Results : Two cases of Superior Mesenteric Artery Syndrome caused by the correction of idiopathic scoliosis were reported. The diagnosis in both cases were confirmed by UGI studies. Both patients underwent duodenojejunostomy for definite treatment. The results of surgical treatments were satisfactory.

Index : Superior Mesenteric Artery Syndrome, SMA syndrome, Duodenal obstruction, Idiopathic Scoliosis.

Reprint request : Dr. Paisarn Vejchapipat
Division of Pediatric Surgery, Department of Surgery
Chulalongkorn University Hospital, Patumwan, Bangkok 10330

ORIGINAL ARTICLE
นิพนธ์ต้นฉบับ

กลุ่มอาการที่เกิดจากหลอดเลือด Superior mesenteric กดทับ ในผู้ป่วยที่ได้รับการผ่าตัดแก้ไขภาวะกระดูกสันหลังหลังคด

ไพศาล เวชชพิพัฒน์
สุทธิพร จิตต์มิตรภาพ

วัตถุประสงค์	เพื่อรายงานผู้ป่วยกลุ่มอาการ Superior Mesenteric Artery
สถาบัน	หน่วยกุมารศัลยศาสตร์ ภาควิชาศัลยศาสตร์ คณะแพทย์ศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ
รูปแบบ	การศึกษาย้อนหลัง
ผล	พบผู้ป่วย 2 รายเป็นกลุ่มอาการ Superior Mesenteric Artery ซึ่งเป็นผลมาจากการแก้ไขภาวะกระดูกสันหลังหลังคดแบบไม่ทราบสาเหตุ ยืนยันการวินิจฉัยด้วยการฉายรังสีทึบแสงของทางเดินอาหารส่วนต้น ผู้ป่วยทั้ง 2 รายได้รับการผ่าตัดรักษาด้วยวิธี Duodenojejunostomy ผลการรักษาเป็นที่น่าพอใจ

Introduction

Compression of the third part of the duodenum by the superior mesenteric artery (SMA) was first described by Rokitansky in 1861[1]. Since that time, this entity has remained a subject of controversy. During the 1960's, the advent of modern roentgenologic techniques provided workers with the evidence needed to support the existence of Superior Mesenteric Artery Syndrome (SMAS)[2]. This report is of personal experience with SMAS in 2 children caused by the correction of idiopathic scoliosis.

Case reports

Case 1.

A girl, twelve years old, who had just underwent surgical correction with pediculous screw for idiopathic thoracolumbar scoliosis, presented with severe persistent bilious vomiting and weight loss for six days after the operation. At first, she looked toxic, and had severe dehydration. Acute Abdominal film showed dilated stomach and first part duodenum with air fluid level (Figure 1 A,B). One litre of bile-stained NG content was aspirated. Radiographically, there were dilatation of stomach and proximal duodenum. There was cutoff pattern of Barium just to the right of vertebral column with diminished gas in the remainder of the bowel (Figure 2). Then, the diagnosis was Superior Mesenteric Artery Syndrome. Conservative treatment (NPO, nasogastric suction, intravenous fluid) started for 7 days. At the end of seven days treatment, there was no improvement. The NG content still exceeded one litre per day.

The patient underwent explor laparotomy after the failure of conservative treatment. Operative findings showed that there was nearly complete obstruction of the third part duodenum caused by SMA compressing on it. Then, duodenojejunostomy was performed in Roux en Y fashion. Perioperative period was uneventful, the patient was discharged from the hospital on the sixth postoperative day. And the patient gained weight as before at 3-month follow up.

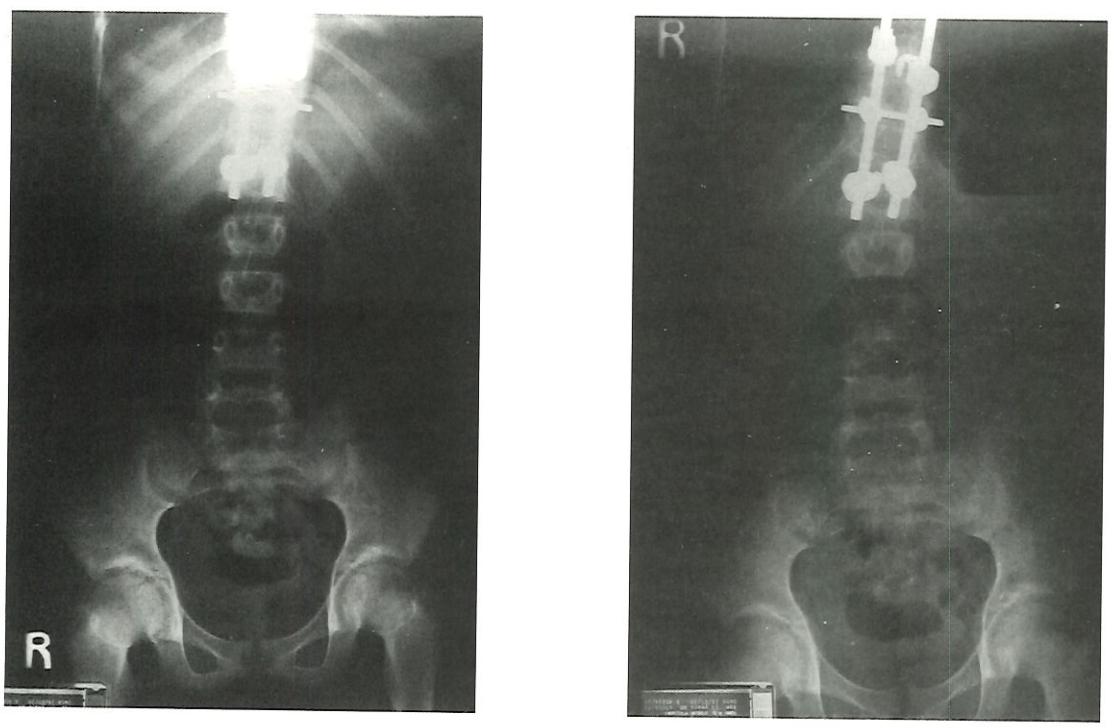

Figure 1 Acute abdomen film showed air filled the dilated stomach and duodenum with minimal gas in the distal bowels (A) with multiple air-fluid level in upright position (B) indicated the gastric outlet obstruction.

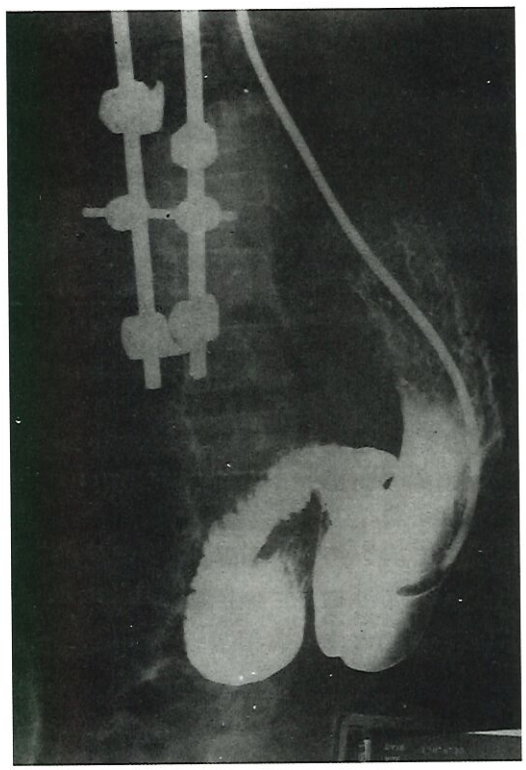

Figure 2 Upper gastrointestinal contrast study in patient #1 showed that the stomach and duodenum are dilated, and that the dilatation of the duodenum was proximal to the portion where the vascular pedicle crossed it, demonstrating a sharp cutoff pattern. SMA syndrome is most likely diagnosis.

Case 2.

A girl, fourteen years old, was admitted to the hospital for correction and treatment of her idiopathic right thoracic scoliosis. After Harrington instrumentation and spine fusion from the fourth thoracic to the third lumbar vertebrae were performed, she vomited some the first day but was then well for fours days. On the fifth postoperative day she again began to severely vomit. Roentgenograms showed obstruction in the third part of the duodenum (Fig. 3). Nasogastric suction was used intermittently for one week without improvement. At surgery, the superior mesenteric artery and vein were stretched tightly across the third part of the duodenum causing nearly complete obstruction. Then, duodenojejunostomy was performed. In the postoperative period, gastrointestinal function returned to normal within three days.

Discussion

SMA syndrome is defined as Intestinal obstruction of the 3rd part duodenum which is caused by the compression of Superior Mesenteric Artery (SMA) over the 3rd part duodenum[3]. This condition is rare.

Normally the third portion of the duodenum originates on the right side of the fourth lumbar vertebral body, passes to the left with a slight upward inclination, and then curls forward around the spinal column to the point where it becomes the fourth portion at the level of the second lumbar vertebra[4]. The SMA originates behind the neck of the pancreas at the first lumbar vertebra. It leaves the aorta at an acute angle (opening caudally) that ranges from 20 to 70 degrees and on the average is 41.25 degrees[5]. If the duodenum crosses higher than usual, if the SMA originates from the aorta at a lower level than

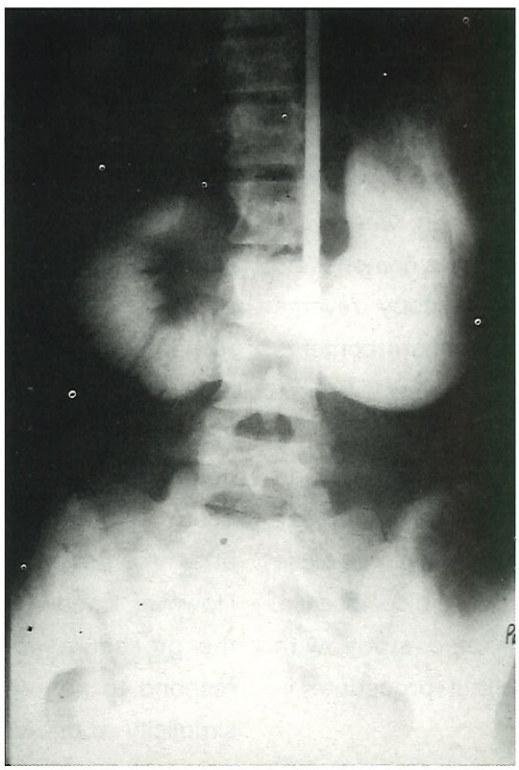

Figure 3 Upper Gastrointestinal study showed obstruction at the third part of duodenum with pathognomonic character of SMA syndrome. The metallic vertebral rod is noted.

normal, or if its angle formed with the aorta more acute, duodenal obstruction may occur. The predisposing factors that may cause SMAS are prolonged supine rest, significant weight loss, a body cast, traction for a spinal injury, or a postoperative phase of surgery for scoliosis[7]. In the report, both patients had SMAS after undergoing the surgical correction of scoliosis. It is known that when the angle of origin of the superior mesenteric artery becomes more acute, partial or complete obstruction of the duodenum may occur. In the patient with scoliosis or kyphosis it seems quite possible that a sudden significant correction of the spinal curvature by cast, brace, internal fixation, or skeleton traction may increase the acuteness of the angle of departure of the superior mesenteric arterial root from the aorta. The report seems to provide clinical evidence supporting this concept.

The syndrome occurs more frequently in teenaged girls and may mimic an anorexia nervosa-like illness6. It is characterized by postpandrial epigastric discomfort and pain, abdominal distention and bilious vomiting. There is no abdominal rigidity associated with epigastric discomfort. The symptoms are relieved to a certain extent when the patient lies on the left side but more characteristic by the knee-chest position. The frequency and severity of the vomiting and abdominal distention rapidly become worse and dehydration is likely to develop. Severe metabolic alkalosis may develop with notable electrolyte disturbance. Oliguria, shock, a ruptured stomach, and death can ensue.

The clinical findings vary in their severity and may be atypical. A high index of suspicion and careful observation of gastrointestinal function are essential especially in patients with predisposing factors. Plain

film of the abdomen may demonstrate gastric and duodenal dilatation with little gas in the remainder of the bowel. Upper GI contrast study shows that the stomach and duodenum are dilated, often to several times their normal size and that the dilatation of the duodenum is proximal to the portion where the vascular pedicle crosses it. Oblique views demonstrate a sharp cutoff pattern. Under fluoroscopy, reverse peristalsis and churning of the duodenum contents may be seen[8]. Angiography with lateral view will show a narrowed SMA to aortic angle[2,9].

The differential diagnosis must include obstruction in the another portion of the duodenum, obstruction below the duodenojejunal junction, gastric outlet obstruction complicated by peptic ulcer disease, and pancreatitis. Roentgenographic study with contrast media is the most helpful procedure in establishing the diagnosis[1,5,7].

Once the disorder is recognized and depending on the clinical condition of the patient, the initial treatment can be conservative in both the acute and the chronic forms[10]. General measures such as NPO, nasogastric suction, intravenous fluids, careful monitoring of fluid intake and output, and serial electrolyte should be performed. Adequate urine output must be maintained. The left lateral, prone, or knee-chest positon is helpful to improve the symptoms. Patients who do not respond to conservative measures require surgical intervention. Generally, few cases require surgery and it should be done only in those not respond to conserative management[5].

To demonstrate the site of the obstruction intraoperatively, inflation of gas via nasogastric tube is advised. Division of the ligament of Treitz, allowing mobilization of the fourth portion of the duodenum, has been suggested as a method of treatment[11]. When the duodenal obstruction cannot be adequately relieved in this fashion, duodenojejunostomy[2,5,8-10] or derotation[1] of is advised. In derotation, the root of mesentery is incised to identify the origin of SMA. With the ligament of Treitz divided, most of the small intestine is passed under the SMA so as to lie completely in the right of the abdomen. The right colon is then separated from its retroperitoneal attachments and moved into the left abdomen. However, duodenojejunostomy[2,5,8-12] is considered as the procedure of choice for those who failed to respond to non-operative treatment because of its simplicity to understand and perform.

In conclusion, the SMAS is a rare condition. The pathophysiologic nature of the syndrome is related to a number of factors, any of which can lead to a decrease in the angle of the SMA as it arises from the aorta. Despite of its rarity, SMAS is a distinct clinical entity that should be considered in the differential diagnosis, especially in the patient displaying signs of upper gastrointestinal obstruction after the correction of scoliosis or kyphosis. Once the diagnosis is established, treatment can be instituted. The results of duodenojejunostomy in both patients are excellent, whereas the morbidity resulting from the SMAS is significant when left untreated.

References:

1. *Marchant EA, Alvear DT, Fagelan KM. True clinical entity of vascular compression of the duodenum in adolescence. Surg Gynecol Obstet 1989;168:381-6*
2. *Gustafsson L. Diagnosis and treatment of superior mesenteric syndrome. Br J Surg 1984;71:499-501*
3. *Paul JG. Acute intestinal obstruction secondary to vascular compression of the duodenum. Am J Surg 1973;126: 658*
4. *Adin JT, Jr. The anatomic basis of vascular compression of the duodenum. Surg Clin North Am 1974;64:1361-8*
5. *Evarts CM, Winter RB, Hall JE. Vascular Compression of the Duodenum Associated with the Treatment of Scoliosis. J Bone Joint Surg 1971; 53-A: 431-44*
6. *Pentlow BD, Dent RG. Acute vascular compression of the duodenum in anorexia nervosa. Br J Surg 1981; 68:665-6*
7. *Yazbeck S. Intestinal obstruction in infancy and childhood. In: Roy CC, Silverman A, Alagille D, eds. Pediatric Clinical Gastroenterology, 4th edition. St. 8.Louis: Mosby-Year Book, Inc., 1995: 104-29*
9. *Burrington JD, Wayne ER. Obstruction of the duodenum by the superior mesenteric artery-does it exist in children? J Pediatr Surg 1974; 9: 733-41*
10. *Mansberger AR, Jr, Hearn JB, Byers RM, et al. Vascular Compression of the Duodenum. Emphasis on Accurate Diagnosis. Am J Surg 1968;115:89-96*
11. *Wayne ER, Burrington JD. Duodenal obstruction by the superior mesenteric artery in children. Surgery 1972;72:762*
12. *Munns SW. Hyperalimentation for superior mesenteric artery (cast) syndrome following corection of spinal deformity. J Bone Joint Surg 1984;66:1175-7*