Abstract. Superior mesenteric artery syndrome (SMAS) is an uncommon cause of vomiting and weight loss due to compression of the third part of the duodenum by the superior mesenteric artery. Small bowel adenocarcinoma is an uncommon tumor, which is frequently delayed in diagnosis as its symptoms and signs are non-specific. The present study describes a case of SMAS occurring in a 51-year-old man, caused by intestinal obstruction secondary to a primary adenocarcinoma of the duodenal-jejunal junction. To the best of our knowledge, the present case is the first report of small bowel adenocarcinoma masquerading as SMAS. The present case highlights the importance of considering the possibility of SMAS in patients with upper bowel obstruction caused by intestinal carcinoma.

Introduction
Superior mesenteric artery syndrome (SMAS) has previously been described under various other names, including, duodenal arterial mesenteric compression, duodenal ileus and Wilkie syndrome (1-3). SMAS is caused by compression of the third part of the duodenum by the superior mesenteric artery (SMA), which takes its origin from the abdominal aorta at the level of the first lumbar vertebra and crosses the duodenum (4,5). The exact prevalence of SMAS worldwide remains unclear, however, the rate has been estimated to be 0.013-0.3%, based on barium studies (6). Treatment is initially conservative, which includes the insertion of a nasogastric tube, mobilization of the patient to a prone, left lateral decubitus position, administration of parenteral nutrition, fluid-electrolyte balance correction and positive nitrogen balance to increase body weight and restore the retroperitoneal fat tissue (7). In cases where conservative treatment has failed, surgery including Treitz ligament division, gastrectomy, subtotal gastrectomy and Billroth II gastrojejunostomy and duodenoejunostomy may be performed to avoid the risk of duodenal atony and massive dilatation. Numerous predisposing conditions for SMAS, including malignancies, burns, prolonged bed rest, anorexia nervosa, malabsorption, anatomical anomalies and surgical complications, have been identified to have possible impacts on the angle between the SMA and the abdominal aorta (7).

Primary small bowel adenocarcinoma is an uncommon tumor, with non-specific symptoms that may cause a delay in diagnosis and, consequently, a negative outcome (8-11). The duodenum is most frequently involved, followed by the jejunum (12). Small bowel adenocarcinomas are rare, accounting for <2% of all tumors of the gastrointestinal tract and ≤40% of all small bowel malignancies in the USA (13). Furthermore, the annual incidence is 1.2-6.5 cases per 1 million individuals. The main treatment for small bowel adenocarcinoma is radical surgical resection (14). The ability to completely resect tumors is one of the most important prognostic factors for survival, and adjuvant chemotherapy is required (15). Small bowel adenocarcinoma exhibits a poor prognosis at all stages of disease, with a 5-year overall survival rate of 14-33% (16). A considerable number of patients with small bowel carcinoma are diagnosed due to upper small bowel obstruction (12). The present study reports a case of a primary adenocarcinoma of the small intestine causing SMAS. The aim of this report was to highlight that SMA syndrome must be considered a symptom, rather than a disease; therefore, determining the cause of SMA syndrome is important.

Case report
In August 2014, a 51-year-old man was admitted to the Department of the Gastroenterology, Kunshan First People’s Hospital Affiliated to Jiangsu University (Kunshan, Jiangsu 215300; 2Department of General Surgery, First Hospital Affiliated to Soochow University, Suzhou, Jiangsu 215006, P.R. China

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Figure 1. Diatrizoate revealed dilation of the proximal duodenum: (A) Supine position and (B) prone position.

Figure 2. Abdominal computed tomography scans. (A) Abdominal computed tomography revealed distension of the duodenal bulb due to compression of the third part of the duodenum. (B) The distance between the abdominal aorta and superior mesenteric artery was ~8 mm. (C) The angle between the abdominal aorta and superior mesenteric artery was ~20°.
SMAS is an uncommon type of upper intestinal obstruction (18). The pathophysiological process of this syndrome, resulting in a decrease in aortomesenteric angle, is commonly regarded as being due to a decrease in retroperitoneal fat following acute weight loss (19). There are a number of known...
aetiologies for SMAS, including malignancies and malabsorption syndromes. Diagnosis of SMAS is dependent on the barium meal findings of duodenal dilation, retention of barium within the duodenum and characteristic vertical linear extrinsic pressure in the third part of the duodenum (19). Previously, angiographic measurement of the aortomesenteric angle was considered the gold standard of diagnosis; an aortomesenteric angle of <22-25° and a distance of <8 mm were observed to correlate well with SMAS (20). However, due to the invasive nature of angiography, CT scanning or upper gastrointestinal series are now more commonly used for the diagnosis of SMAS (20).

Primary adenocarcinoma of the small intestine is 40-60 times less frequent compared with colon cancer (21). The diagnosis of small bowel adenocarcinoma is frequently delayed as its symptoms and signs are non-specific. It may develop in any location, but is more frequent in proximal segments, particularly the duodenum and upper jejunum (22).

The current study reported a case of primary adenocarcinoma of the small intestine presenting as SMAS. The patient received conservative therapy for two weeks in the gastroenterology department for the treatment of SMAS; however, the upper gastrointestinal obstructive symptoms demonstrated no significant improvement. Laparotomy revealed complete obstruction of the duodenal-jejunal junction by a primary small intestine adenocarcinoma; how the present patient subsequently developed SMAS is unclear. A plausible explanation may be that the significant weight loss induced by the tumor, as well as a reduction in the angle at which the SMA branched from the aorta, led to compression of the third portion of the duodenum.

In conclusion, the present case highlights that SMAS may be considered as a symptom of a disease, rather than a primary diagnosis. Thus, research investigating the cause of the condition is required. In patients with SMAS, if conservative treatment fails, surgery should then be considered as the next available option.

References