Robot-assisted surgical treatment in a case of superior mesenteric artery syndrome

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ABSTRACT

We present a case of superior mesenteric artery syndrome in a 14-year-old female. The patient was initially managed using dietary changes and postprandial assumption of the left lateral decubitus position. However, after 2 months with no improvement, the patient was treated using a robot-assisted Strong's procedure. The patient fully recovered within 1 year. We further discuss superior mesenteric artery syndrome and its current treatment practices, and give a general overview of the current state of robot-assisted surgery.

CASE PRESENTATION

A 14-year-old female was referred to the general surgery department with early satiety, postprandial vomiting and epigastric pain, which improved in the left lateral decubitus position. She reported a 10 kg weight loss in the previous 3 months. There was no history of nutritional disorders, upper gastrointestinal symptoms, or any other medical conditions. Other than the stated symptoms and her low body mass index (BMI), the patient was relatively healthy. No use of pain medication was mentioned.

An upper gastrointestinal endoscopy was performed, showing neither pyloric stricture nor inflammation of the stomach; however, there was external compression of the third portion of the duodenum. A subsequent computed tomography (CT) scan showed a dilated stomach and proximal duodenum, and computed imaging reconstruction showed a narrowed aortomesenteric angle with a pathognomonic short distance of 3 mm between the aorta and the superior mesenteric artery. This confirmed the diagnosis of superior mesenteric artery syndrome. The patient was unwilling to be hospitalized and refused parenteral nutrition; thus she was initially sent home with instructions to take small, liquefied, high-caloric meals and to stay in the left lateral decubitus position after meals. After 2 months, the patient reported slight pain relief, but as the treatment yielded neither weight gain nor radiologic improvement, surgical treatment was decided.

SURGERY

To avoid complications of anastomotic bypass procedures, and to maintain the integrity of the gastrointestinal tract, it was decided that the preferred surgical treatment for the patient was a Strong’s procedure. Robot-assisted surgery using the da Vinci system was used to provide a minimally invasive approach.

For this laparoscopic approach, four ports were used. A camera port was placed inferior to the umbilicus; two robotic trocars were placed bilaterally at the level of the umbilicus at the mid-clavicular line; and one subcostal trocar was placed at the left anterior axillary line. The surgeon identified the dilated third portion of the duodenum and mobilized it by dissecting its retroperitoneal attachments and dividing the ligament of Treitz. The fourth portion of the duodenum and the duodenojejunal junction were then peritonised to allow for their mobilization. The junction was brought to the right of the superior mesenteric vessels and dissected from its attachments. Finally, a full circumferential dissection of the superior mesenteric axis and the aortomesenteric space allowed the proximal jejunal loops to be translocated to the right of the superior mesenteric artery and sutured in place. The entire operation lasted 1 hour and 15 minutes, with insignificant intraoperative blood loss.

CASE OUTCOME

The patient was fully mobilized a few hours after the surgery, although the nasogastric tube was kept for 24 hours. An upper gastrointestinal series confirmed free passage of contrast to the jejunum, and oral fluid intake was initiated the next day. The patient was discharged from the hospital uneventfully by the third postoperative day. By three months, the patient had full clinical and radiological regression of her manifestations and significant weight gain. By 1 year, the patient had fully recovered and was symptom-free.

DISCUSSION

Superior Mesenteric Artery Syndrome

Superior mesenteric artery (SMA) syndrome, also called Wilkie’s syndrome, was first described in 1842 by Carl von Rokitansky. Sir David Wilkie published the first case series of SMA syndrome in 1927, describing 75 patients.1 SMA syndrome is caused by compression of the duodenum between the aorta and the superior mesenteric artery, where the resulting inadequate aortomesenteric angle causes obstruction of the duodenum. A normal aortomesenteric angle is between 380 and 560 degrees, and the aortomesenteric distance is normally between 10 and 28 mm.2 A diagnosis of SMA syndrome may be made with a reduction of 6 to 160 in the angle and 2 to 8 mm in the aortomesenteric distance.3 SMA syndrome is a rare disease, with a prevalence ranging 0.013% to 0.3%, although the syndrome is more common in females and patients between 10 and 39 years of age.1

Predisposing factors include significant weight loss, dietary disorders, scoliosis, post-operative conditions, trauma, congenital anomalies, and other local pathologies.2 The case above describes a typical presentation of SMA syndrome, involving nausea, vomiting, epigastric pain, loss of appetite, and weight loss. The
associated with significantly lower blood loss, lower conversion
surgeries but also potentially higher rates of spleen preservation.
A review of pancreatic surgery in 2012 found comparable morbidity
versus open thoracic surgery for lung cancer found that RAS resulted
effective than conventional surgery, although measures of success
differences in blood loss, complication rates, or hospital stay, but
of conversion to open surgery. Also, a 2017 review of pediatric
alimentary and urologic surgery found that although there were no
clear advantages to RAS, there were no statistical differences in
complication rate either. However, studies have also reported findings to the contrary.
A 2016 systematic review and meta-analysis of randomized control
trials comparing RAS to conventional laparoscopic surgery found
that, of 20 studies comprising 981 patients, there were no significant
differences in blood loss, complication rates, or hospital stay, but
operative times were significantly longer. The study concluded that
RAS was not worth the significantly higher cost at the time.
Furthermore, there are still problems with RAS systems. A 2008 review of the United States Food and Drug Administration
(US FDA) Manufacturer and User Facility Device Experience
Database (MAUDE) found a total of 189 device failures between
January 1, 2000 and August 27, 2007, of which 4.8% (9 cases) were
adverse events reported, 94% were converted in 2003, as compared
to 16% in 2007. A systematic review in 2013 also found that RAS
could also result in port site metastases when used in carcinoma
removal, although this only occurred in 2% of cases (5 of 204).
In 2012, the Canadian Agency for Drugs and Technologies
in Health conducted studies regarding the clinical and cost-
effectiveness of robot-assisted prostatectomies, hysterectomies,
partial nephrectomies, and cardiac surgery in Canada. They found
that although RAS was at least as clinically effective as conventional
open or laparoscopic surgery in all four procedures, it was only
slightly cost-effective in hysterectomies, and cost-neutral in cardiac
surgery. In summary, more trials with longer follow-up times are
necessary to better determine the clinical and cost-effectiveness
of robot-assisted surgery. In addition, more development needs
to be focused on reducing its cost and improving systems to better
improve patient outcomes.

CONCLUSION
We present a case of superior mesenteric artery syndrome
treated to full recovery by a robot-assisted Strong’s procedure.
Our case and discussion call to attention a rare syndrome and the
multiple treatment avenues available for it, all of which require
careful patient-specific consideration. Our case thus highlights
both the difficulty and the importance of diagnosing and treating
SMA syndrome.
Furthermore, given the current debate on the effectiveness
of robot-assisted surgery, our case presents a timely discussion on the
benefits and drawbacks of RAS. We conclude that in its current
state, RAS follows the paradigm shift towards minimally invasive
procedures but has varying degrees of success and may not be cost-
effective for widespread use in Canada.
REFERENCES


