Three-dimensional reconstruction model in the diagnosis of Morgagni’s hernia

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SUMMARY
Morgagni’s hernia (MH) can be diagnosed by different utilities, but all these methods are not always 100% accurate. Three-dimensional (3D) reconstruction model could be helpful in better understanding the important anatomical structures. We report a case of MH who was once misdiagnosed as diaphragmatic eventration at the other institution and we offered laparoscopic repair according to the 3D reconstruction model. Our case highlights that 3D reconstruction model could be a useful supplementary tool in the diagnosis and preoperative assessment for patients with MH especially when it is confused in diagnosis in clinical practice.

BACKGROUND
Morgagni’s hernia (MH) is a relatively rare congenital diaphragmatic hernia making up about 3% of all surgical hernias. 1 MH in adults may present with nonspecific symptoms such as chronic pain and pulmonary complaints. Although some diagnostic means could be useful in diagnosis and treatment, their use is still limited in preoperative evaluation and surgical planning. Three-dimensional (3D) reconstruction technology has made its way into clinical practice for better visualising anatomical structural details.

CASE PRESENTATION
A 74-year-old woman who presented with a 4-year history of mild dysphagia and intermittent epigastric pain, aggravating in the supine position while subsiding in the sitting, was admitted to our institution. The patient’s body mass index was 19.8 kg/m2. She was diagnosed as diaphragmatic eventration and underwent diaphragmatic plication through right thoracotomy incision in the other institution 2 years ago. However, the epigastric pain did not alleviate obviously and she had to continue to take painkillers and omeprazole until she was transferred to our hospital.

Enhanced CT scan of the chest and upper abdomen showed the presence of a right anteromedial diaphragmatic hernia, with a defect in diaphragm that measured 6.4 cm in diameter. The right lung was partly collapsed and the colon, mesenteric fat and omentum were visible within the right hemithorax (figure 1). The most likely diagnosis for this patient was MH. To avoid the misdiagnosis of the disease, we further decided to realise the 3D reconstruction model of the hernia using the CT images during the preoperative evaluation. The 3D model showed the protrusion of the large bowel and mesenteric vessels through the defect of diaphragm into the chest (figure 1). Meanwhile, the diaphragm was not elevated from the lateral position (figure 2). According to the model MH was confirmed and the patient was advised to have an operation.

TREATMENT
Laparoscopic repair of diaphragmatic hernia was performed. The contents of hernia sac were colon and omentum and MH was further definitely confirmed during the operation. After the reduction of abdominal bowel contents, a composite mesh was offered to repair the defect. The surgical procedure was uneventful and was not affected by the previous operation fortunately.

OUTCOME AND FOLLOW-UP
The patient had an uncomplicated postoperative course and symptomatic resolution and was discharged on postoperative day 4. Follow-up thoracic CT confirmed the absence of bowel contents in the thorax and the patient remained asymptomatic at 6 and 12 months.

DISCUSSION
MH is the most uncommon type of diaphragmatic hernias and always discovered in female adults. 2 MH often develops in the right hemithorax, while the left-sided or bilateral defects are rare because of the protection provided by the heart and pericardium. In adults, they may occasionally be asymptomatic and were found on chest X-ray, but nearly 72% of the patients are symptomatic, especially when there is the possibility of visceral obstruction or strangulation. 2 Therefore, early and accurate diagnosis is of great importance to avoid the undesirable serious complications and wrong treatment.

The diagnostic utilities of MH include chest X-ray, CT, barium enema or MRI. Although CT has emerged as the most common choice, it is not always 100%...
Three-dimensional (3D) reconstruction imaging model is a useful supplement utility to avoid the misdiagnosis of Morgagni’s hernia. The 3D model could facilitate the preoperative evaluation and surgical planning for patients with Morgagni’s hernia. It also proves helpful in better understanding the anatomical structures for residents and students in medical education.