

Strangulated Intrapericardial Diaphragmatic Hernia after Hybrid Maze Procedure

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ABSTRACT

Convergent hybrid maze procedure is very safe and effective surgical modality for the treatment of refractory atrial fibrillation. It carries very little risk of complications and an intrapericardial diaphragmatic hernia is amongst the rarest of complications. Only three cases of intrapericardial hernia have been reported in literature till date. This case report describes a middle aged gentleman admitted in emergency department with life-threatening condition of small bowel obstruction secondary to strangulated intrapericardial diaphragmatic hernia. He was resuscitated in Surgical Assessment Unit and underwent emergency laparotomy involving bowel resection and repair of diaphragmatic hernia.

Key Words: *Intestinal obstruction, Hybrid maze procedure, Atrial fibrillation, Cardiac ablation, Intrapericardial hernia.*

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INTRODUCTION

Among the newer techniques for atrial fibrillation, maze procedure, that involves radiofrequency and cryoablation, is considered the gold standard since 1980.^{1,2} Hybrid maze technique is a newer and minimally invasive modality for surgical treatment of atrial fibrillation.^{3,4} It is usually very safe and effective and carries little risk and low rates of complications.⁴ The window made in diaphragm is potential space for herniation. The window is made during the minimal invasive procedure by the cardiothoracic surgeon *via* intra-abdominal trans-diaphragmatic approach. Till date, only three cases have been reported in literature about the rare complication of diaphragmatic hernia after maze procedure.^{5,6} We report a rare case of potentially life-threatening complication of this procedure – strangulated hernia through the diaphragmatic window into the pericardium in a patient who had undergone surgical epicardial ablation in the past.

CASE REPORT

A 62-year gentleman presented in the Surgical Assessment Unit with symptoms of worsening abdominal pain and vomiting for the last three days. His medical history was significant for coronary artery disease and atrial fibrillation. He had a two-staged hybrid epicardial ablation at another hospital three years ago. Currently, he was on warfarin therapy. Examination revealed signs

of dehydration and distended, tender abdomen with a 4 cm upper midline scar without evidence of incisional hernia. His electrocardiogram (ECG) was unremarkable, but he had leucocytosis, elevated C-reactive protein (CRP), international normalised ratio (INR) of 4.8 and normal serum amylase. He was rehydrated with intravenous (IV) fluids and analgesia was given. Plain radiographs of abdomen and chest showed distended small bowel loops in the centre of abdomen, bilateral basal lung atelectasis and normal heart/mediastinal shadow. A computed tomography (CT) scan of abdomen and pelvis was performed which revealed herniation of small bowel into the lower mediastinum causing proximal small bowel obstruction (Figures 1 and 2). A diagnosis of small bowel obstruction secondary to strangulated diaphragmatic hernia was made. Supportive treatment was started including IV fluids, analgesics, nasogastric decompression and Foley catheterisation. He was taken to theatre after written informed consent for operative repair of the hernia. The possible options of laparoscopy and laparotomy were discussed in detail. Consultant anaesthetist evaluated the patient and prothrombin complex concentrate (Beriplex®) was administered to normalise INR preoperatively.

His abdomen was tense and distended precluding laparoscopy, so a decision to proceed with laparotomy *via* upper midline incision was made. Small bowel was grossly distended up to distal jejunum, a loop of which was found to be entering into the pericardial cavity through a 5x2 cm hole in the diaphragm (Figure 3). The strangulated small bowel loops were gently reduced from the pericardial sac and returned to the abdominal cavity, which was examined for ischemia. After application of warm saline-soaked packs, bowel loops regained

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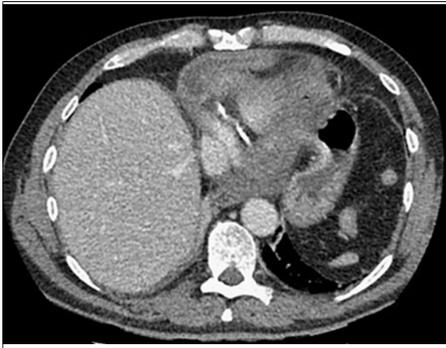


Figure 1: CT scan of lower chest and upper abdomen showing bowel loops in the pericardial.



Figure 2: CT scan of lower chest and abdomen showing loops of bowel in the pericardium and grossly distended small bowel loops in abdomen.



Figure 3: Intraoperative image of defect in the diaphragm after reduction of herniated bowel loops.

normal colour. The distal bowel loops and caecum were collapsed. During handling of the distended jejunum, a dusky patch of perforation was noted, which was repaired in two layers after freshening of edges. Peritoneal lavage was carried out. The diaphragmatic defect was examined and found to be lax. Hernia sac was left *in situ* without excision. The defect was closed primarily without a mesh using interrupted 0-ethibond sutures. The rest of the procedure was completed as per standard laparotomy and two abdominal drains were placed.

Postoperatively, the patient was transferred to intensive treatment unit (ITU). During his stay there, transthoracic echocardiogram was performed without evidence of pericardial effusion. He was stepped down to the ward and discharged home later with follow-up in outpatient clinic.

DISCUSSION

Maze procedure is a relatively newer minimally invasive surgical technique for cardiac ablation for atrial fibrillation, started in 1980s.¹ It utilises bipolar radiofrequency ablation and cryoablation and is considered the gold standard for surgical treatment of atrial fibrillation.² It has evolved over the years and has undergone various alterations. Hybrid or convergent maze procedure combines delivery of radiofrequency energy *via* an endocardial catheter, which is usually introduced through the femoral vein and another catheter directly accessing the epicardium. Various approaches have been considered for epicardial catheters including percutaneous epicardial catheters, thoracic, subxiphoid and trans-abdominal, trans-diaphragmatic approaches using a laparoscope.^{3,4} The laparoscopic approach is considered minimally invasive, safe and effective with minimal complications and allowing direct visualisation of the epicardium.⁴ This technique involves incising diaphragm lateral to central tendon to access pericardium laparoscopically. At the end of procedure, usually a drain is placed to prevent cardiac tamponade.⁵

It is very rare for the abdominal contents to herniate through this small defect in the diaphragm into the peri-

cardial cavity. To our knowledge, this is the first case of a strangulated intrapericardial diaphragmatic hernia after hybrid ablation procedure in UK; and fourth case that has been reported in literature until now.

Intrapericardial hernias, like other diaphragmatic hernias, can be classified as congenital and acquired.⁶ Congenital forms are the rarest. Iatrogenic causes include post-operative coronary artery bypass grafting (CABG), pericardial window, epidural pacemaker placement, cholecystectomy, splenectomy, gastrectomy, oesophagectomy and gastric operations.

Intrapericardial diaphragmatic hernia may be presented in emergency department with features of bowel obstruction and strangulation. A high index of suspicion should be kept while coming across patients with features of bowel obstruction after laparoscopic ablation procedure. Diagnosis is based on CT scan findings of abdominal contents in the pericardial sac.

The management involves the same principles as for all other abdominal wall hernias including correction of fluid and electrolyte imbalances, adequate pain relief and urgent surgical intervention. Owing to the narrow neck of the hernia and a small pericardial sac, such patients are at increased risk of developing serious complications including ischemia of contents and heart failure secondary to extrinsic pressure. Urgent surgical correction is mandatory. Laparoscopic approach can be considered wherever it is feasible to do so without doing any harm. If that is not possible, conventional laparotomy should be considered without any delay. Diaphragmatic defect can be closed primarily with or without a mesh and buttressed with the liver.^{7,8}

These patients can have delayed postoperative recovery and often need intensive care. It is always desirable to involve senior members of surgical, anaesthetic and ITU teams including cardiologist.⁵

As the hybrid technique for treatment of atrial fibrillation is gaining popularity these days, cardiologists involved in this procedure should be made aware of this rare but potentially life-threatening adverse event. Immediate closure of the diaphragmatic defect is recommended.

PATIENT'S CONSENT:

A written informed consent has been obtained from the patient to publish data related to this case.

CONFLICT OF INTEREST:

Authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

MF: Patient was examined and managed, data collection, literature review and report writing.

TCS: Patient was examined and managed and supervised throughout.

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