Diaphragm Hernia After Subcostal Single Port Robotic Lung Resection

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Introduction

Single port robotic technology (SP) allows for a single incision either in a subxiphoid or subcostal location. Subcostal incision allows avoidance of the intercostal space and potential chronic intercostal nerve pain. In a subcostal incision, the diaphragm is incised to allow access to the pleural space and then subsequently closed. A commonly used technique for diaphragm closure involves suturing the diaphragm to the transversalis and external oblique muscles and then closing the external oblique muscle. There are a few unpublished reports of diaphragm hernia after the subcostal approach. We describe a case of a SP robotic lung resection via a subcostal incision that resulted in a diaphragm hernia.

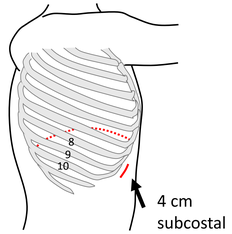

Fig 1. Position of incision

Case Description

A 64 year-old female, BMI 24, with a history of right upper lobectomy for stage IIA right upper lobe adenocarcinoma was found to have an enlarging 1 cm left upper lobe nodule on surveillance CT scan. Navigational bronchoscopy with biopsy of this nodule demonstrated non-small cell lung cancer. Repeat PFTs supported resection and she was taken to the OR for left single port robotic left upper lobe wedge resection and mediastinal lymph node dissection. Routine chest x-ray on postoperative day 2 (Fig 2) showed an elevated left hemidiaphragm and a large gastric bubble. An NGT was placed and CT chest obtained (Fig 3) which showed a left-sided diaphragm hernia with an intrathoracic stomach and splenic flexure of the colon. She was taken to the OR urgently for diaphragm repair.

Fig 2. Postoperative day 2 CXR

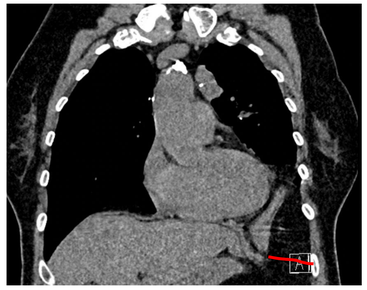

Fig 3. Red line indicates diaphragm defect

Case Description

On exploration via the subcostal incision, the prior diaphragm closure had pulled away allowing for herniation of intra-abdominal contents. Decision was made to attempt primary repair. Hernia contents were reduced into the abdomen, and the diaphragm was re-sutured to the transversalis and external oblique muscles, and the external oblique was closed. PACU CXR (Fig 4) demonstrated left pneumothorax and elevated left hemidiaphragm. Due to concern for re-herniation, she was taken back to the OR for repeat exploration.

Fig 4. PACU CXR after attempted primary repair

In the OR, the subcostal incision was opened. The prior sutures were still intact, but the adjacent diaphragm had torn and separated. As attempt at primary repair had failed, decision was made to proceed with mesh repair of the diaphragm, via thoracotomy. A 10 cm serratus sparing lateral thoracotomy in the 8th intercostal space was performed. The defect was closed using a 2 mm Gore-Tex mesh using 0-prolene sutures. Intercostal nerve cryoablation was performed for T5-T9. CXR in the PACU showed intact diaphragm repair (Fig 5). Patient recovered well without complication. She was discharged home on postoperative day five. Currently, seven months after her wedge resection, patient is doing well with an intact repair on CT scan (Fig 6), ongoing left lower chest wall numbness, and minimal pain.

Fig 5. Postoperative CXR after mesh repair

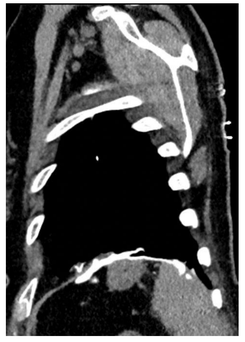

Fig 6. Seven months after repair with intact mesh

Discussion

There were no intraoperative concerns with the diaphragm closure at the time of index operation. On exploration, the closure sutures were intact, but the adjacent diaphragm tore, likely due to excess tension on the diaphragm. Repair with a Gore-Tex mesh allowed for tension free repair of the defect which provides a secure, long-term repair. We have had a subsequent case of diaphragm herniation via the SP subcostal approach. This was explored through the abdomen. Robotic multiport repair of the diaphragm defect using a 2 mm Gore-Tex mesh patch secured with pledgeted interrupted 0-ethibond mattress sutures was found to be an easier repair technique and favorable for the patient.

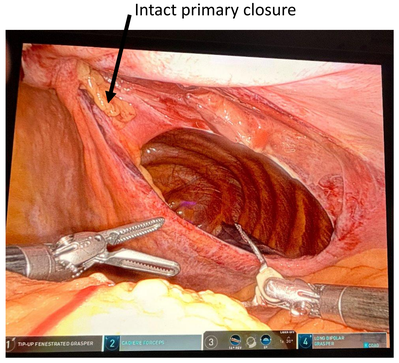

Fig 7. View of hernia from abdominal approach

Conclusions

Diaphragm hernia is a devastating complication after SP robotic surgeries performed via the subcostal approach. As the SP robotic platform gains popularity in thoracic surgery and concerns grow about this complication, new ways to incise and repair the diaphragm are being considered.