Case report - Thoracic non-oncologic
Thoracoscopic removal of a suture needle from the posterior pericardium after coronary artery bypass grafting

Nathaniel Liu\textsuperscript{a}, Robert Gilkeson\textsuperscript{b}, Alan Markowitz\textsuperscript{c,d}, Carsten Schröder\textsuperscript{a,b,*}

\textsuperscript{a}Department of Surgery, Case Medical Center/University Hospitals, Cleveland, OH, USA
\textsuperscript{b}Division of Thoracic and Esophageal Surgery, Case Medical Center/University Hospitals, Cleveland, OH, USA
\textsuperscript{c}Division of Cardiac Surgery, Case Medical Center/University Hospitals, Cleveland, OH, USA
\textsuperscript{d}Department of Radiology, Case Medical Center/University Hospitals, Cleveland, OH, USA

Received 3 December 2010; received in revised form 3 May 2011; accepted 16 May 2011

Abstract

We demonstrate a minimally-invasive thoracoscopic approach [video-assisted thoracic surgery (VATS)] for removal of a retained pericardial suture needle after standard coronary artery bypass grafting (CABG) surgery. A 46-year-old male presented with unstable angina. His workup demonstrated significant coronary artery disease for which he underwent a six vessel CABG, including entering the left chest for preparation of the left internal mammary artery (LIMA). At seven weeks, a postoperative chest X-ray demonstrated a foreign body (suture needle) present in the cardiac silhouette. Further computed tomography (CT)-scan imaging confirmed the suture needle to be localized in the left inferior–posterior pericardium. The patient underwent a left VATS exploration for removal of the suture needle. The pericardial suture needle was successfully retrieved thoracoscopically. The chest tube was removed on the first postoperative day and the patient was discharged to home on the second postoperative day. The patient’s postoperative course and recovery were uneventful. A minimally-invasive approach can be undertaken for the removal of a foreign body even after prior open chest surgery, avoiding the associated morbidity of a repeat sternotomy.

Keywords: Foreign body removal; Minimally-invasive surgery; Thoracoscopy/video-assisted thoracic surgery; Redo operation

1. Introduction

The majority of thoracic foreign bodies are related to inhalation or ingestion, especially in the pediatric population [1, 2]. Post-traumatic [3–6] and iatrogenic [7, 8] foreign bodies have been reported. Approaches for removing foreign bodies traditionally have been limited to open techniques, bronchoscopy or endoscopic removal. Guidelines for removal of foreign bodies stress timing of diagnosis and potential for complications. Complications include pericarditis, foreign body reaction, pain, arrhythmia, tamponade and significant patient anxiety [9]. Minimal invasive approaches via video-assisted thoracic surgery (VATS) have been demonstrated predominantly in traumatic thoracic foreign body removal cases in a primary surgical setting [5–7, 10]. There is only one report in the literature describing a thoracoscopic approach to remove congealed adhesive material one year after coronary artery bypass grafting (CABG) [8]. We demonstrate successful removal of a retained pericardial suture needle via VATS eight weeks after a standard CABG operation.

2. Case report

A 46-year-old male was referred to cardiac surgery for acute severe three vessel disease. A trans-thoracic echocardiogram was performed which demonstrated an ejection fraction of approximately 35%. The patient was taken for urgent revascularization.

The patient underwent a CABG procedure with six total revascularizations. His postoperative course was uneventful except for a persistent left pleural effusion. He was discharged on postoperative day 5 (Fig. 1a). Seven weeks after resolution of the pleural effusion a follow-up chest X-ray demonstrated a suture needle overlying the cardiac silhouette (Fig. 1b). The patient underwent a computed tomography (CT)-scan of the chest to localize the needle (Fig. 1c, d). A thoracic surgery consultation was requested for possible minimally-invasive approaches to remove the needle. The patient was counseled that the needle should be removed since we could not guarantee that it would remain harmless in the future. Two months after his initial surgery the patient underwent a VATS foreign body removal.

The patient was positioned supine with a roll for spine and shoulder elevation and left arm extended to maximize exposure to the left chest. Bilateral groins, sternum and
left chest were prepped to allow for any needed open conversion. Upon entry into the chest, dense adhesions were encountered. Blunt dissection and electrocautery were required to free the adhesions. Given the posterior-lateral location of the needle, great care was taken to maximize exposure to the pericardium. A retraction suture was placed in the diaphragm to increase the working space in the thorax. The needle was localized intraoperatively by anatomical orientation. A limited posterior pericardotomy was made using electrocautery. The needle was visualized mobile within the pericardium and easily removed with a grasper (Video 2, Fig. 2a). The closest bypass (ca. 4 cm baso-ventral) was not encountered. The pericardium was left open and a single chest tube was placed. A total of three 1 cm incisions and a single 3 mm incision were used (Fig. 2b). The chest tube was removed on the following day and the patient discharged home on the second postoperative day. His further recovery was uneventful.

3. Discussion

Minimally-invasive VATS approaches to retrieve foreign bodies from the chest cavity are mainly found in pediatric left chest were prepped to allow for any needed open conversion. Upon entry into the chest, dense adhesions were encountered. Blunt dissection and electrocautery were required to free the adhesions. Given the posterior-lateral location of the needle, great care was taken to maximize exposure to the pericardium. A retraction suture was placed in the diaphragm to increase the working space in the thorax. The needle was localized intraoperatively by anatomical orientation. A limited posterior pericardotomy was made using electrocautery. The needle was visualized mobile within the pericardium and easily removed with a grasper (Video 2, Fig. 2a). The closest bypass (ca. 4 cm baso-ventral) was not encountered. The pericardium was left open and a single chest tube was placed. A total of three 1 cm incisions and a single 3 mm incision were used (Fig. 2b). The chest tube was removed on the following day and the patient discharged home on the second postoperative day. His further recovery was uneventful.

3. Discussion

Minimally-invasive VATS approaches to retrieve foreign bodies from the chest cavity are mainly found in pediatric
cases and in stable trauma patients [1, 2, 6, 9]. There is only one report in the literature describing a thoracoscopic technique to remove iatrogenic congealed material from the pericardium one year after CABG [8]. The presence of iatrogenic suture needles in the pericardium is a rare complication. These events are usually not publicized for obvious reasons. As often in these cases of incidental postoperative foreign body detection, our two separate counts were correct at the time of the initial surgery, and the needle probably found its way back into the chest adherent to a large tape positioned underneath the heart.

Thoracic procedures can be challenging after coronary artery bypass procedures, as the thoracic cavity is often violated for the harvest of the left internal mammary artery (LIMA) and significant adhesions preclude the minimal invasive approach. In this case, as expected, the majority of the operation time was spent dissecting adhesions between the left lower lobe, diaphragm and pericardium (total operating time: 101 min). The actual pericardiotomy and needle retrieval took <15 min.

The preoperative diagnostic workup was essential to plan the optimal surgical approach. The three-dimensional (3D)-reconstruction of the cardiac gated CT-scan (Fig. 1c, d, Video 1) helped significantly to spatially plan the operation and to determine the anatomical landmarks. The orientation of the bypass grafts and their distance from the suture needle could be demonstrated in a fully animated way, as could the 3D relationship between the needle, pericardium, and the surrounding structures (bony structures, large vessels, lung tissue etc.). We believe that alternative diagnostic methods [angiography or cardiac magnetic resonance imaging (MRI)] are inferior and carry a higher technique related risk (dye load, access route complications and magnetic field related needle dislocation).

Other surgical approaches include a subxiphoid open or VATS pericardial exploration [8]. The limited spatial and instrumental access makes this approach a less controlled and safe option. Also an intrapericardial dissection would be surgically challenging; the constant epicardial irritations induce arrhythmias, anterior retraction of the heart would decrease the already reduced cardiac output, and the coronary grafts are at risk for damage. An attempt to remove the foreign body through a redo median sternotomy would bring all the known risks; injury to the bypass grafts while freeing the entire pericardial space, and wound healing issues, to name just the obvious. A thoracotomy would be an alternative to the minimal invasive approach, but would certainly not allow the patient to leave the hospital by the first or second postoperative day. We prefer in these cases a modified spine and shoulder elevated 30° lateral position, where both groin and sternum are prepped for any surgical back-up intervention.

A minimally-invasive, thoracoscopic approach can be utilized to safely remove a foreign body from the pericardium even after prior open heart surgery, avoiding the associated morbidity of a repeat sternotomy and significantly decreasing the recovery period.

Acknowledgments

The authors thank Garry Coffee for his video editing and media support.

References