Pulmonary artery bullet injury following thoracic gunshot wound

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Received 11 May 1998; received in revised form 5 October 1998; accepted 28 October 1998

Abstract
Thoracic trauma occurs frequently but seldom requires surgery (10–20%, [1]). The mortality rate for gunshot wound of the chest varies from 14.3 to 36.8% [2]. We report, herein an example of bullet injury to the pulmonary artery (PA) following a thoracic gunshot wound. This patient had previous history of coronary surgery. Absolute and relative indications for exploratory thoracotomy in emergency will be reviewed. © 1999 Elsevier Science B.V. All rights reserved.

Keywords: Chest trauma; Thoracic gunshot wounds; Bullet embolus; Pulmonary artery injury

1. Case report
A 69-year-old man presented to the emergency unit after sustaining a single gunshot wound to the left side of the chest, due to a hunting accident. There was no exit wound. Previous history of cardiac surgery including coronary bypass grafting for triple-vessel disease (internal mammary artery and two venous bypass conduits) through median sternotomy was found 5 years before. Examination revealed blood pressure of 160/95 mmHg, pulse rate of 78 beats/min and respiratory rate of 16/min. He was conscious and complained of thoracic pain. The heart and lungs were normal. An entrance wound was noted on the left side of the chest, 1 inch lateral to the anterior axillary line. Arterial blood gases did not detected hypoxemia or acidosis. ECG showed sequel of right ventricular infarction and a normal sinus rhythm. Chest radiograph revealed a bullet (0.22 long rifle) in the right part of the mediastinum without evidence of hemothorax (Fig. 1). CT scan (Figs. 2 and 3) demonstrated the penetrating injury on the antero-lateral side of the pulmonary artery trunk with the exit wound on the posterior wall of the right pulmonary artery and the bullet localized close to the bronchus. Haematoma was individualized facing the pulmonary artery trunk with con- fusion in the left upper pulmonary lobe. Echocardiography confirmed absence of left ventricular dysfunction and the integrity of the cardiac structures. Considering the quiet clinical status of the patient with normal vital signs and the anticipated difficulty of a redo cardiac surgery in emergency, we planned medical standby for the first 24 h. Bronchoscopy, TEE and CT scan indicated delayed surgery to avoid the potential risk of late perforation of the bronchus wall, the prevalence of infectious compli- cations in a patient with a history of coronary surgery. Surgery was performed the following day through the median sternotomy. Dissection of the mediastinum and the great vessels was difficult but safe. Control of closed rupture of the left antero-lateral side of the pulmonary trunk (penetrating injury) was repaired using large, Teflon-reinforced mattress sutures. This procedure was made just before disturbing the haematoma in order to limit any bleeding.

Fortunately, the path taken by the bullet passed closely to the left internal mammary artery implanted on the coronary artery. Extraction of the bullet for the police department, required control of the superior vena cavae, the aorta and the right pulmonary artery proximally and distally. Dissection of these great vessels was difficult due to previous cardiac surgery. The left hemithorax was explored, the bullet was

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found to have tracked through the apex of the upper lobe causing significant bleeding during surgical dissection, which was controlled with a TIA stapler. The wounds were irrigated, two mediastinal chest tubes were placed and after the sternum was closed, the patient was transferred to the intensive care unit in a stable condition. He was extubated within the first 24 h postoperatively. The patient made a complete recovery and was discharged 7 days later. At a follow-up 6 months later, the patient remained healthy.

2. Discussion

The findings of a bullet with an entrance through the pulmonary artery trunk, the exit wound back to the right pulmonary artery closely to the bronchus and the information obtained from the patient that he had previous coronary surgery pointed to an uncommon condition. The majority of thoracic trauma patients can be treated with tube thoracostomy alone. They are, however, several indications for exploratory thoracotomy for wound penetrating injuries that could lead to unnecessary mortality if they are not recognized. Most bullets that enter the body and do not exit usually lodge within the soft tissue or target organs. About 80% of cases with bullet embolization following gunshot wound involve the arterial system and only 20% the venous circulation [3]. The main factors affecting the migration of a bullet in the venous system included the force of blood flow, missile size and velocity, gravity, body position and respiratory movement [4]. The current case specifies another factor, previous cardiac or thoracic surgery. The clinical feature of pulmonary artery emboli from missile vary and often produce a confusing picture to the physician evaluat-
ing the trauma patient [4]. Many reported instances were asymptomatic [4], with in some cases, chest pain, dyspnea and hemoptysis. The complications of PA bullet emboli include pulmonary infarction, erosion of arterial wall and local haemorrhages [4]. Death from pulmonary embolus has been reported [3]. The diagnosis of pulmonary artery injury should be considered in any gunshot-wound patient with no exit wound [4]. Chest radiography and particularly CT scans are useful in reconstructing the course of the missile as seen in our patient. Such investigative tools will at least demonstrate the presence of the bullet and its possible migration. In planning exploratory thoracotomy, it is essential to understand the track of the missile or penetrating object. The low velocity of the offending missile (0.22 long rifle), as shown by its penetration through the pulmonary vessels, only stopped by the wall of the bronchus, accounts for delayed operative strategy. The scar tissue formation and strong pericardial adhesions due to previous cardiac surgery through median sternotomy have been probably contributing in preventing immediate massive bleeding caused by perforation of the pulmonary trunk.

Controversy still exists regarding the treatment of bullet emboli within the venous system although there is general agreement that such arterial injury or emboli must be removed promptly [2]. The indications for emergency thoracotomy include the following: massive bleeding with persistent blood loss, bronchial injury (massive air leak), esophageal injury, pericardial tamponade, diaphragmatic injury, great vessel injuries and acute deterioration of the patient’s condition. Several authors have recommended that venous embolectomy should be performed particularly when the bullets are in the pulmonary artery and its branches either by a thoracotomy, median sternotomy or percutaneous catheterization [4]. In rare cases, bullets have been left in place [5] with the potential risk of migration and hemoptysis in the future. Bullet extraction in the pulmonary system should be done as soon as feasible, even in asymptomatic patients. The use of cardiopulmonary bypass (CPB) may lead to severe hemorrhage when associated injuries are present [6]; CPB therefore should be used judiciously in this setting, with simple repair of cardiac injuries when possible. Suspected injuries to the root of the great vessels or the heart require median sternotomy, even in redo surgery as in our patient [6].

References