Repair of acute mediastinoscopic injury to the pulmonary artery using an intravascular approach and deep hypothermic circulatory arrest

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Abstract

A potentially serious but rare complication of mediastinoscopy procedures is acute damage to any of the great vessels in the region of the distal trachea and carina. We report a case of serious hemorrhage from a mediastinoscopic biopsy-injury to the posterior aspects of the right pulmonary artery (RPA), which required sternotomy, cardiopulmonary bypass, division and retraction of the ascending aorta, incision of the RPA, intermittent deep hypothermic circulatory arrest, and suturing from the inside of the RPA for a successful repair.

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1. Case report

A 69-year-old woman with a history of fibromyalgia and previous thyroid-surgery was suffering from aggravated fatigue and dyspnoea. A CT scan revealed enlarged lymph nodes in the mediastinum, and the patient was referred for a diagnostic cervical mediastinoscopy for suspected sarcoidosis. During this procedure, biopsies were taken from lymph nodes adjacent to the carina and right main bronchus, when a profuse bleeding arose. A gauze tamponade was immediately packed into the surgical canal, and control was achieved after bleeding approximately 500 ml. In an initial attempt of extended conservative treatment, the skin was closed over the gauze pack and the patient was allowed to recover in the intensive care unit, with the aim to keep the pack in place for 2–3 days. During this time, the patient was hemodynamically stable with no signs of further bleeding. PA pressures were not measured.

The patient was brought back to the OR for removal of the gauze pack under general anesthesia, when there was a new profound bleeding from the surgical canal, this time approximately 900 ml. After repacking the wound, an immediate decision for surgical intervention was made.

The surgical approach was discussed. The likely diagnosis was an injury to the posterior aspects of the right pulmonary artery (RPA), which could possibly be reached from a right posterolateral incision. However, the risk of having to perform an urgent right pneumonectomy due to uncontrollable bleeding was obvious and not deemed acceptable in a patient with a suspected benign disease.

A median sternotomy approach was chosen. The pericardium was opened and there was no obvious bleeding with the cervical tamponade still in place. After trying to remove it again with the heart exposed, the bleeding was seen actually coming from the posterior RPA, with no possibility of direct external suturing. The patient was heparinized and cannulated in the distal ascending aorta and the right atrium, after which cardiopulmonary bypass was instituted with full cooling. As further exposure of the injury was difficult anatomically and from excessive bleeding, we elected to repair it from the inside of the RPA. After clamping the aorta and giving both antegrade and retrograde blood cardioplegia, full exposure of the RPA was achieved by complete division of the ascending aorta and retraction of the ends by stay sutures. Simultaneously, the patient was cooled to 17 °C and the circulation stopped intermittently. The RPA was incised longitudinally and extended underneath the superior vena cava, which was entirely mobilized and retracted from the artery. The injury was found laterally in the posterior wall of the RPA, circular shaped...
and approximately 0.5 cm in diameter. It was confirmed by probing and subsequently closed from the inside by several 5–0 polypropylene mattress sutures, reinforced by pericardial pledgets. The RPA incision was closed with a longitudinal pericardial patch, to avoid constriction and tension. The aorta was re-anastomosed in a standard fashion.

The patient came easily off cardiopulmonary bypass and there was no further bleeding. Total bypass time and clamp time was 219 and 146 min, respectively. Deep hypothermic circulatory arrest (DHCA) was used for a total of 24 min. The further postoperative course was uneventful and the patient was discharged after 6 days. Histopathological diagnosis from the mediastinoscopy biopsies showed sarcoidosis.

2. Discussion

Cervical mediastinoscopy was introduced by Carlens in 1959 and is a well-established procedure for staging of pulmonary malignancies and diagnosis of other mediastinal disorders. The procedure has been extensively evaluated as highly effective and safe, and thereby recommended as routine investigation in the diagnosis of thoracic disease [1,2]. In general, the reported complication rates have been very low. Potentially serious complications, however, include pneumothorax, left recurrent nerve paralysis, tracheal or esophageal rupture, wound infection and major hemorrhage. Puhakka studied over 2000 patients between 1968 and 1987 and found an overall complication rate of 2.3%, with major complications occurring in only 0.5% [2].

Although the mediastinoscope is introduced in the paratracheal plane in close proximity to the innominate artery and vein, the pulmonary artery and numerous bronchial vessels, major hemorrhage is a very infrequent complication. In an early study of 1250 mediastinoscopies, there were 17 hemorrhages, seven of which necessitated throracotomy [3]. Similarly, Urschel reported of two major bleedings in a series of 324 patients, arising from the pulmonary artery. Both cases could be controlled by gauze packing and did not require further surgery [4]. Recently, Park and associates [5] reviewed the management of major hemorrhage at their institution. Only 14 patients of 3391 mediastinoscopies (0.4%) experienced a major bleeding, and all of them underwent surgery after initial control of the bleeding by packing. Injuries to the pulmonary artery could be directly repaired via an extended sternotomy and anterolateral thoracotomy, and no patient required cardiopulmonary bypass. In contrast, Schmidli and associates [6] reported a successful repair of a mediastinoscopic injury to the right common carotid artery using end-to-end suturing under DHCA.

In our center, about 80 mediastinoscopies are performed yearly, and serious hemorrhage has been very rare. In this patient, however, it became clear that there was a major bleeding source caused by the biopsy instrument. The bleeding was initially controlled by gauze packing, but when this strategy failed, surgical intervention was inevitable. Hemostatic sponges were not urgently available and were not used in the initial treatment. During surgery using a median sternotomy approach, we found that the exposure of the posterolateral RPA bleeding site was even more difficult than anticipated, and thus we assessed the safest method to be an intravascular repair. This approach has been routinely used in elective surgery for chronic pulmonary embolism [7], and in our case involved complete division of the ascending aorta and intermittent DHCA. Access to the RPA, however, can be achieved without dividing the ascending aorta. By incising the RPA in this patient, the injury could be evaluated and safely closed from the inside. A key part of the procedure was the subsequent closing of the longitudinal incision in the RPA with a pericardial patch, to avoid constriction or tearing of the fragile vessel wall.

The approach of intravascular repair under intermittent DHCA may seem rather overzealous at thought, but due to the urgency of the situation and the anatomically difficult position of this kind of injury, we believe the described surgical method is a safe and plausible option for repair of this rare but potentially fatal mediastinoscopic complication.

References