Case report - Thoracic oncologic

A tip for controlling the main pulmonary artery during video-assisted thoracic major pulmonary resection: the outside-field vascular clamping technique

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Abstract

Cross-clamping the main pulmonary artery (PA) is a risky, stressful procedure for the general thoracic surgeon performing video-assisted thoracic major pulmonary resection (VATS). However, converting VATS to thoracotomy each time PA clamping is planned is a poor tactic. We present a simpler technique for VATS than the traditional method involving a thoracotomy. In VATS, DeBakey vascular clamps with double angle jaws are inserted through 1-cm access incisions. We clamped the main PA so as to maintain the limited visual field through the working port. Thus, we modified the position of these vascular clamps, which we call ‘the outside-field vascular clamping technique’. Our technique should be used for VATS lobectomy to prevent conversion to open thoracotomy when one requires scheduled control of the PA during VATS.

1. Introduction

Cross-clamping the main pulmonary artery (PA) poses an uncertain, demanding procedure for the general thoracic surgeon performing video-assisted thoracic major pulmonary resection (VATS). This procedure is usually done through an open thoracotomy, but converting VATS to thoracotomy each time PA clamping is planned is a poor strategy. Some authors have described methodological exploration [1, 2]. Here, we present an easier, simpler technique compared to the traditional method. We believe that this approach can be applied to a wide range of surgical procedures, not only control of the main PA [1, 2], but also bronchoplasty [3, 4] and completion pneumonectomy [5].

2. Technique

In VATS, a working port measuring <8 cm in length is made in the fourth or fifth intercostal space. We commonly decide the length of the utility access incision based on the size of the specimen to be removed and the operating technique, while adhering to the principle of cutting intercostal muscle for a length equal to the skin incision. One or two additional 1.2-cm thoracic ports are made in the seventh or ninth intercostal space. The working port is protected with a polyurethane wound retractor (Alexis® wound retractor; Applied Medical Resources, Rancho Santa Margarita, CA, USA). Naturally, no patient required segmental rib resection or rib spreading. We perform a procedure in which the ratio of direct visualization to monitoring is about 7:3, which has been previously reported [3].

Two DeBakey vascular clamps with double angle jaws are inserted through 1-cm access incisions. We clamp the main PA to maintain the limited visual field through the working port. In the conventional approach, the vascular clamps are inserted through a thoracotomy, but they sometimes obstruct the limited visual field through the working port. Thus, we modified the position of these vascular clamps, which we call ‘the outside-field vascular clamping technique’ (Figs. 1 and 2).

We performed this procedure in two patients; case 1 was a 78-year-old woman with primary adenocarcinoma of the anterior segment (segment 3) of the left upper lobe. The tumor had invaded the anterior branch [6] of the left PA, and we performed an arterioplasty with a left upper lobectomy. After the outside-field vascular clamping, we sutured the left PA at the base of the apicoposterior branch using continuous non-absorbable 3-0 monofilament. The operating time was 176 min, and blood loss was 55 g. Her post-operative course was uneventful and she was discharged on postoperative day 5.

Case 2 involved an 81-year-old woman with primary adenocarcinoma of the inferior segment (segment 5) of the lingula of the left upper lobe. Hilar lymph nodes had inflammatory adhesions to the apicoposterior and anterior branches [6] of the left PA, and we also performed an...
arterioplasty with a left upper lobectomy. After the outside-field vascular clamping, we reduced the PA pressure and then resected the left PA at the base of both the apicoposterior and anterior branches using a stapler device, loaded with a 45-mm gray cartridge (Endo GIA™ Universal Roticulator™ 45-2.0; Tyco Healthcare Group LP, Norwalk, CT, USA). The operating time was 200 min, and blood loss was 56 g. Her postoperative course was uneventful and she was discharged on postoperative day 10.

3. Discussion

Care should be taken regarding the location of the 1-cm access incisions. With regard to identifying sites for the access incisions, there are differences that depend on the shape of the vascular clamps, body size, and the relative anatomical position of the PA. Liberally interpreted, the access incision for the center vascular clamp should be made in the third intercostal space on the mid-axillary line and the other access incision, for the distal clamp, in the sixth or seventh intercostal space on the posterior axillary line. Our method has several advantages: the DeBakey vascular clamps with double-angle jaws do not obstruct the visual field, conventional vascular clamps can be used, and the surgery is minimally-invasive. Disadvantages are the increased number of 1-cm access incisions and the limited handling of the vascular clamps, resulting from the pivot point of the 1-cm access incisions. The advent of minimally-invasive surgery can enable methodological changes. However, maintaining the quality of surgery is important, while minimizing the destruction and deformity of the thoracic cage. In particular, we think that rib cutting and spreading is a major disadvantage to the patient, because of impaired cellular immunity [7], increased pain, shoulder dysfunction, and impaired early pulmonary function [8]. We do not always adhere to a complete VATS [9] because more procedures can be performed with direct visualization through a minithoracotomy [10]. We aim to perform as wide a range of techniques as possible. No need exists to focus on whether a procedure is complete or assisted with the VATS approach. This depends on the surgeon’s preference and a complete or VATS approach is immaterial to the patient.

In summary, the presented technique should be used for VATS lobectomy to prevent conversion to open thoracotomy when one requires scheduled control of the PA during VATS. At present, we do not recommend this technique when one requires urgent control of PA bleeding.
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