

The management of doornail lymph node in lobectomy

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Background: The management of heavily adhesion caused by enlarged or calcified lymph nodes is long been one of the most common difficulties in lobectomy. Some of the lymph nodes, known as “the doornail lymph node”, develop such massive adhesions that it significantly elevated the risk of uncontrollable bleeding and consequent conversion.

Methods: We performed a triple portal video-assisted thoracic surgery procedure. Lymph nodes were managed with coagulator, aspirator, scissors and suture. Arteries, veins and bronchus were ligated with stapler.

Results: One case of a 74-year-old female patient with multiple doornail lymph nodes was presented. An optimal technique to manage these lymph nodes was utilized: first, dissect the sheath of the blood vessel to find a bypass, second, remove the calcified core of the lymph node, and last, suture through the lymph node to ligate the adjacent artery. The surgery was successfully performed without complication.

Conclusions: The sequential technique of sheath dissection, core removal and suture ligation might be an optimal procedure in the management of doornail lymph node.

Keywords: Doornail lymph node; artery sheath; suture; calcification; adhesion

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Introduction

One optimal technique for lobectomy is based on full exposure of the artery, vein and bronchus respectively. Lymph node, in this case, plays two significant roles. It is, on one hand, the guidepost of major blood vessels, which helps surgeons to locate essential structures. On the other hand, enlarged lymph node frequently causes severe tissue adhesion, which increases the risk of intra-operative bleeding and consequent conversion to thoracotomy (1-4). The management of lymph node is therefore a challenging topic.

In order to manage these lymph nodes, the ultra-close vision derived from Wang's technique is mandatory. Only the pointing end of the coagulator and aspirator should be included in the vision, and the lymph node and the adjacent

structure should fill out the entire screen. Clear vision is the key to precisely recognize the edge between a lymph node and a blood vessel, thus allows the dissection. During the procedure, the dissection of the artery sheath is essential. Most of enlarged lymph nodes only infiltrate the membrane surrounding the blood vessel, and can be removed along with the artery sheath. Electric coagulator should be utilized with extreme caution. Only the tissue that could be lifted from the surface of the blood vessel can be electrically coagulated. Otherwise, coagulator should be utilized for blunt dissection to slowly separate the lymph node from the major structure.

In some cases, when the adhesion is so inseparable that the boundary between structures has totally been invaded. The lymph node loses its own sphere shape and turns into a flat chewing-gum like structure that strains the surrounding

tissues together. This kind of lymph node is usually deemed anatomically impossible to dissect, which is also known as “the doornail lymph node” (5). In most cases, dissection of the sheath surrounding the blood vessel will help to find a bypass for ligation. Otherwise, the lymph node will not be able to be en bloc dissected. The calcified core of the lymph node should be removed, and the remaining capsule might be able to be peeled off. In some rare cases, the calcified core even invaded the vascular wall, and cannot be removed. The traditional suture ligation technique is then mandatory in these circumstances.

The purpose of this article is to provide an introduction to the methods described above, and share a typical case with doornail lymph node.

Patient selection and workup

A 74-year-old female patient presented nodule in the right middle lobe in a yearly screening chest CT scan was administered on Jun 1th, 2014. There was no complaint of coughing, increasing sputum, chest pain, or fever. PET-CT indicated a high uptake lesion in the right middle lobe with SUV_{max} at 3.8 with the diameter of 1.7 cm, highly suspicious of lung cancer. Abnormal uptake calcified lymph nodes (SUV_{max} 4.4) were detected on both hilum of the lung, suspicious of reactive hyperplasia.

A 10-year history of hypertension was presented, with blood pressure well controlled. Other medical conditions include slight hyperthyroidism, and chronic sinusitis. No history of smoking or alcohol abuse was presented. The patient is allergic to penicillin.

No signs with diagnostic value were found during the physical exam.

Pre-operative preparation

ECG indicated stage I atrioventricular heart block. Echocardiogram indicated normal heart function, with ejection fraction at 72.4%. Blood gas shows pO₂ at 61.7 mmHg, pCO₂ 31.8 mmHg. The spirometry test was carried out to evaluate tolerance of lobectomy. FEV1 was 1.37, DLCO% was 75.9%. No metastasis was observed according to PET-CT. Deep breathing exercise was introduced to refine lung capacity.

Urinary catheter was intubated and coloclisis was performed pre-operatively.

Equipment preference card

The video system we used is IMAGE1 Hub HD with ICM (KARL STORZ, Inc., Germany). Ligasure (Medtronic, Inc., MN, USA) and EndoGIA (Medtronic, Inc., MN, USA) was used for ligation.

Procedure

The left-lateral position was taken and general anesthesia was performed. The crossing point of 7th intercostal space and midaxillary line was chosen as observing incision. Crossing point of 5th intercostal space and the anterior axillary line was used for the major operating incision of 4 cm in length. A 1 cm long supplementary incision was made on the crossing point of 7th intercostal space and subscapular angle line. Neither adhesion of the pleural cavity nor pleural effusion was found. The mass was located on the lateral segment of the right middle lobe, adjacent to the intersection of horizontal and oblique fissures. The visceral pleura appeared white and grey in color, and rough and sunken in texture. No other nodules were palpated or observed after exploration. Both the fissures were well differentiated. The anterior hilum of the lung was adjoined to the anterior mediastinum. The inferior pulmonary ligament was dissected, as well as the pleura surrounding the hilum. Calcified doornail lymph node was observed in the anterior hilum, adjoining the partial pleura with the middle lobe vein. The sheath surrounding the blood vessel was carefully dissected. The posterior edge of the middle lobe vein was exposed where a little branch vein observed and ligated with Ligasure. Then the horizontal fissure was dissected from the anterior end in order to reveal the upper edge of the middle lobe vein. Stapler was used to ligate the middle lobe vein. After dissection of inter-lobar pleura, a branch vein communicating between the upper lobe and the middle lobe vein was observed and ligated with coagulator. The portal area was dissected and the middle lobe bronchus was found to be surrounded by enlarged lymph nodes which simultaneously adhered to the pulmonary arteries. The medial segment artery was dissociated after opening the artery sheath, and was ligated with a stapler. The lateral segment artery, however, adhered so tightly to the lymph node that it was unable to be dissected. The blood flow in the artery was intercepted by suturing through the lymph node and tie knots. A stapler was utilized to ligate the



Figure 1 Dissection of the anterior hilum (6).

Available online: <http://www.asvide.com/articles/758>



Figure 2 Dissection of the oblique and horizontal fissures (7).

Available online: <http://www.asvide.com/articles/759>

bronchus and the artery all together at about 1 cm distal to the initiating part of the bronchus itself. No visual bleeding or air leaking was observed. A drainage tube was placed in the pleural cavity. And the operation was completed.

Role of team members

Primary surgeon runs the operation. The jobs of the first and second assistant are to hold camera and to help exposing the surgery field by lifting the lung tissue with oval forceps.

Anesthesiologists are responsible for intubation of the double lumen bronchea cannula, which is essential in deflating the lung tissue to create space for operation.

Physicians from cardiology and pulmonology are responsible for the evaluation of heart and lung function to rule out contraindications.

Post-operative management

No complications were observed. The drainage tube was removed 4 days postoperatively. And the patient was discharged on the 5th day after the operation.

Tips, tricks and pitfalls

The four major section of the operation that carries the most difficulties are illustrated through the four videos.

Video 1 Dissection of the anterior hilum (Figure 1)

A doornail lymph node was found in anterior mediastinum, caused severe adhesion among the proximal end of middle lobe and upper lobe vein, anterior side of right middle lobe and anterior mediastinum. In order to avoid the nervusphrenicus, lung tissue was cut through to expose the middle lobe vein. After preliminarily exposing veins, enlarged lymph nodes appeared between the upper and middle lobe vein. Then the sheath of the vein was precisely dissected, and the in between lymph nodes were still unable to be separated from the main structures. Put aside the upper edge of the pulmonary hilum. The next step is to split the lower part of the oblique fissure. Enlarged lymph node was encountered in the fissure. Attempts of dissection to the proximal end and the posterior edge of the middle lobe vein were made and were obstructed by the lymph node and pericardium. The anterior route seemed to reach an impasse.

Video 2 Dissection of the oblique and horizontal fissures (Figure 2)

Enlarged lymph node in the oblique fissure was found to extend all the way to the upper oblique fissure, overlapping the proximal end of the basal segment artery and the distal end of the main stem. After opening the sheath of the basal segment artery, the lower part of the enlarged lymph node was separated from the artery. The posterior edge was fully exposed, while the anterior edge was unable to dissect after a couple of efforts in pushing with the coagulator. Then the horizontal fissure was dissected precisely, all the way to the crossing point of the artery and the overlapping lymph node.



Figure 3 Ligation of the vein and artery (8).

Available online: <http://www.asvide.com/articles/760>



Figure 4 Ligation of the bronchus (9).

Available online: <http://www.asvide.com/articles/761>

Video 3 Ligation of the vein and artery (Figure 3)

The middle lobe was lifted to the lateral chest wall to provide a best exposure of the area of the proximal end of the middle lobe vein. Lymph node was first pushed apart from the proximal end of the middle lobe vein. The posterior edge of the vein was carefully dissected to dissociate the vein as long as possible. After ligated the branch vein with Ligasure, scissors were used to cut through the remaining envelope of the lymph node. Then middle lobe vein is successfully ligated. The lymph node is subsequently carefully separated from the upper edge of the bronchia. The coagulator and the aspirator are utilized for blunt dissection, and coagulation is used with particular caution. After removal of the lymph node, the intermediate artery sheath was opened. Thus the artery moved forward and became anterior to the upper lobe vein. Further dissection of the intermediate artery was performed to the adjacent point where the lymph node overlapped the artery.

Video 4 Ligation of the bronchus (Figure 4)

The overlapping lymph node was cut through right on top of the proximal end of the basal segment artery. Bleeding was proved to come from the nutrient artery of the lymph node, and was carefully managed by full dissection of the artery sheath and coagulation on both end of the bleeding artery. The medial segment artery is then exposed and ligated. The medial segment artery sheath is dissected to the distal end. With the distal end secured, the overlapping lymph node was cut through. A calcified core of the lymph node was discovered stuck to the lateral segment artery and is unable to be removed. Thus a transfixion was performed to ligate the medial artery together without full removal of the lymph node, and the bronchia and the artery were ligated all together with green stapler.

Conclusions

The sequential technique of sheath dissection, core removal and suture ligation might be an optimal procedure in the management of doornail lymph node. Intraoperative bleeding and conversion to thoracotomy were successfully prevented and no complications were observed in the perioperative period.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Ethical Statement: The study is approved by the institutional ethical committee. Written informed consent was obtained from the patient. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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