



# Surgery for Lung Cancer Invading Vena Cava Superior, Aorta and Left Atrium

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## Editorial

Lung cancer is one of the most common causes of cancer related mortality [1,2]. Surgical resection is a substantial component of multidisciplinary treatment for locally advanced lung cancers. More than 50% of Non-Small Cell Lung Cancers (NSCLC) patients present with unresectable metastatic disease or tumors. Lung cancer invading the mediastinum is currently classified as T4 disease [3]. Treatment for advanced stage NSCLC is challenging, particularly for the surgical management of T4 tumors invading Vena Cava Superior (VCS), aorta and left atrium [4].

Neoadjuvant therapy is used for down-staging locally advanced lung cancers, by reducing tumor size and lymph node involvement. It is mostly recommended before the surgery of T4 tumors with invasion of the aorta, pulmonary artery, left atrium, or esophagus. Induction therapy used for this subset of T4 tumors which is still heavily debated, is a combination of preoperative chemotherapy or chemoradiotherapy [4-6]. Induction therapy followed by extended resection for this small subset of T4 tumors has been used to date; with very little data to provide meaningful recommendations [4].

## Resection of Lung Cancer Invading the VCS

Lung cancer with vena cava superior invasion is present in 1% of operated patients with NSCLC. The prognosis is worse in VCS resected patients with N2 (R2, R4 and 3) compared to VCS resected patients with N0-1 and their 5 year survival rates are 6.6% ve 36% respectively [7]. The morbidity for VCS resection is between 0% - 40% whereas the mortality is between 0% - 14% [7-9]. Superior vena caval resection and reconstruction can be performed through tangential or complete resection. Heparinization is recommended before VCS resection. If less than 15% of VCS is involved with the tumor, then en bloc resection can be performed by a partial occlusion clamp for primary suturing. Depending on the size of the defect, patch repair can be preferred with autologous pericardium or prosthesis. If more than 50% of the VCS requires resection, a graft replacement becomes vital [9,10]. Early graft thrombosis (within 1 month) has been reported to be as high as 11%. Late graft thrombosis has been reported as high as 30%. Therefore, postoperative anticoagulation usage is advised for at least 3 to 6 months [9]. As a result, surgery is recommended for N0-1 diseases due to better prognosis. N2 disease should be carefully examined preoperatively due to poor survival in operated patients with N2 disease. If there is a N2 disease, surgery should be performed in experienced multi disciplinary centers after induction therapy.

## Resection of Lung Cancer Invading the Aorta

A malignant thoracic tumor with invasion of the aorta has poor prognosis. Patients with a T4 tumor invading the aorta should be treated with a preoperative induction therapy [11]. Preoperative mediastinal lymph node dissection is necessary before radical resection [12]. When absence of mediastinal lymph nodal involvement's histologic evidence is proved, a radical resection of the affected aorta should be performed. Partial resection or patch replacement can be performed as well while both procedures do not require Cardio Pulmonary Bypass (CPB) generally; whereas circumferential resection requires total CPB. Unfortunately, this type of surgery is associated with a high morbidity of 34%. Significant complications such as postoperative bleeding, intrapleural bleeding and death are reported. Five-year survival rates except the case series of Ohta, range from 31% to 48.2% [11,13]. Surprisingly, 5-year survival rate was 70% for patients with N0 disease in case series of Ohta et al. [11].

## Resection of Lung Cancer Invading the Left Atrium

Lung cancer invading the left atrium usually occurs in the atrial wall via direct invasion or by

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tumor embolus. Cardiac MRI is commonly used in atrium invasion suspected patients to assess the extent of invasion. The most critical part of atrium resection surgery is the dissection involving the sectioning of the interatrial muscle which leads to interatrial groove. The interatrial groove is referred as Sondergaard. The opening of Sondergaard improves the access to the left atrium. After a large Satinsky clampage, the tumor can be resected followed by primary closure. CPB is not necessary for this approach. There are many series regarding left atrium invasion, general five year survival rates are between 14% - 25%. Recently, Galvaing et al. [12] reported their results of 19 patients whom underwent left atrial resection. 5 year survival was 41% with a 11% operative mortality and 53% morbidity.

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