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Case Report / Приказ случаја

Aleksandar Ristanović^{1,†}, Zoran Bjelanović², Vanja Kostovski¹,
Nebojsa Marić¹, Nataša Vešović¹, Ljubinko Đenić¹

Surgical treatment of lung tumors with infiltration superior v. cava

Хируршки третман тумора плућа са инфилтрацијом горње шупље вене

¹ Military Medical Academy, Clinic for Thoracic Surgery, Belgrade, Serbia

² Military Medical Academy, Clinic for Vascular Surgery, Belgrade, Serbia

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† **Correspondence to:**

Aleksandar RISTANOVIĆ

Military Medical Academy, Clinic for Thoracic Surgery, 17 Crnotravska Street, 11000 Belgrade, Serbia

E-mail: pandrcmilena@yahoo.com

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SUMMARY

Introduction Direct malignant invasion by primary lung tumors or by nodular metastases is the most frequent indication for VCS resection and reconstruction.

The aim of our work was to underline the importance of good evaluation and preoperative work up from the standpoint of the overall survival.

Case outline A male patient, aged 61, has been admitted for the surgical treatment of adenocarcinoma of the right lung upper lobe. The proposed protocol for the treatment of our patient comprised: radiological verification, biopsy with histopathology analysis, standard upper lobectomy with mediastinal lymphadenectomy and with resection of the VCS with a length of about 30 mm. Reconstruction VCS was done by the implantation of vascular graft INTERGARD 16 mm. In our patient, grafting and bridging VCS structure, prevented the development of postoperative vascular complications and improved survival from the beginning of the treatment.

Conclusion Mixed thoracic and vascular surgical treatment reduces postoperative complications and improves survival.

Keywords: surgical treatment; lung tumor; superior vena cava

САЖЕТАК

Увод Директна малигна инвазија примарним тумором плућа или нодуларним метастазама је најчешћа индикација за ресекцију и реконструкцију горње шупље вене (ГШВ).

Циљ нашег рада је био да истакне важност добре преоперативне процене и припреме за смањење оперативног морталитета и просечно преживљавање.

Приказ болесника Мушкарац стар 61 годину је примљен ради хируршког лечења аденокарцинома горњег режња десног плућа. Протокол за лечење пацијента је укључивао: радиолошку верификацију, биопсију са хистопатолошким анализом, стандардну горњу десну лобектомију са медијастиналном лимфаденектомијом и ресекцијом ГШВ у дужини од 30 мм. Реконструкција ГШВ је учињена имплантацијом васкуларног графта INTERGARD 16 мм. То је превенирало развој постоперативних васкуларних компликација и побољшало преживљавање од почетка лечења.

Закључак Комбиновано васкуларно и груднохируршко лечење смањује постоперативне компликације и побољшава преживљавање.

Кључне речи: хируршки третман, тумор плућа, инфилтрација v.cavae superior

INTRODUCTION

Surgical resection is controversial for the patients with lung cancer infiltrating a great vessel because of its poor prognosis, although it can be an oncologic emergency leading to circulation and airway compromises.

VCS infiltration represents a complex diagnosis confirmed with imaging studies. Initial evaluation includes a detailed lung cancer history and physical examination. Using chest radiography, a growing right-sided mediastinal or hilar mass is seen in most lung cancer patients. Some authors suggest perfusion lung scintigraphy as a complement to morphological diagnosis as part of the preoperative evaluation of patients [1-3]. Based on the above, it could be said that perfusion scintigraphy has its place in the diagnostic algorithm as part of the assessment of functional operability. Contrast-enhanced computed tomography (CT) can further delineate the point of infiltration and the size and character of the infiltrating mass (tumor or nodal involvement), as well as evaluate any additional structures the tumor has invaded.

Darteville et al. recommend the radical approach by using combined surgical technique that improves 5-year survival [4-5]. Some other authors prefer sparing surgery, especially when the advanced tumor growth with the invasion of the SVC or IVC is a limiting factor [6].

The aim of this case report is to underline the importance of good preoperative evaluation and preparation for the operative mortality and overall survival in patients with lung cancer infiltrating a great vessel that underwent a radical resection for primary lung cancer and an infiltrated great vessel.

CASE REPORT

A male patient, aged 61, has been admitted to the surgical treatment of adenocarcinoma of the upper lobe of the right lung. Medical history reveals that the dispnoea symptoms occurred 6 months earlier, with pain in the right hemithorax that occurs after a trauma. Clinically, there were not conspicuous findings, while biochemically increased inflammation factors, with normocytic normochromic anemia were demonstrated.

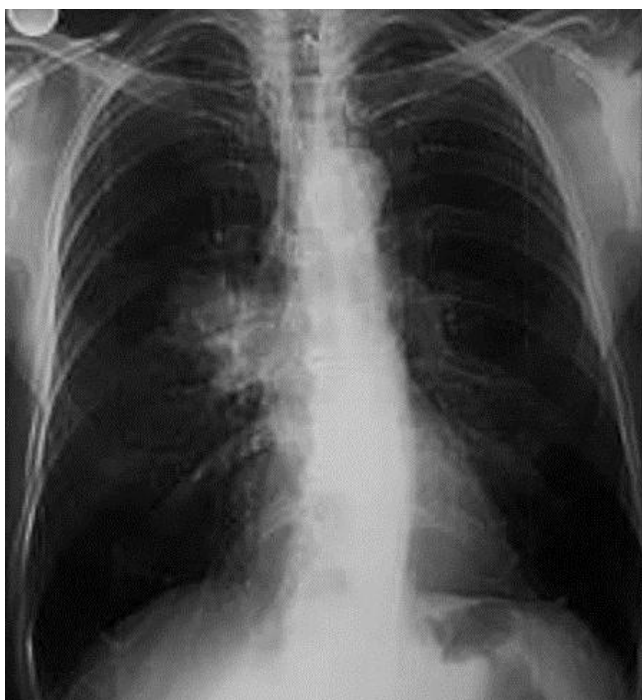


Figure 1. Conventional chest radiography in the PA projection : shading in the upper right lobe.

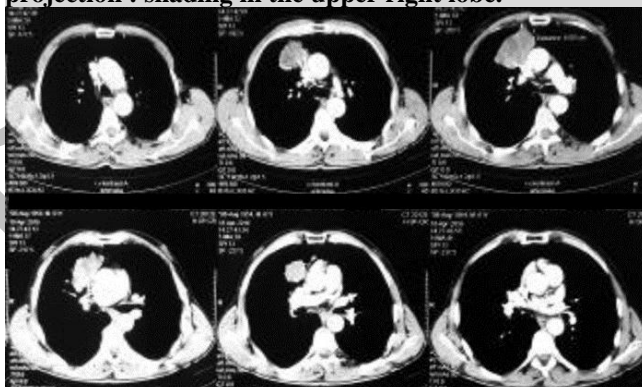


Figure 2. MSCT chest: tumor's change, diameter up to 70 mm in the anterior segment of the upper lobe , not invades VCS .

Radiological findings in lung PA projection verified tumor shadow in the upper right lobe (Figure 1).

The patient was pulmonary fully processed, with spirometry in terms of obstruction and FEV1: 1.87 (61 %). He also underwent bronchoscopy, by which subsegmental bronchus closed with white patches tumor mass was verified and then bronchobiopsy proved adenocarcinoma (histopathologic findings: adenocarcinoma pulmonis G3). MSCT chest pointed out a tumor diameter of 70 mm in the anterior segment of the upper lobe, limited by medial mediastinal pleura, which reaches the ascending aorta and v.cava superior (Figure 2). Pathologically altered mediastinal or hilar lymph nodes were not seen. In the case of our patient, using visual method (MSCT of the chest) invasion of the v.cava superior has not been verified, which was proved intraoperatively and resolved, while the functional diagnostic has never been done. Perfusion scintigraphy detected carcinoma of the right lung T4N2M0 – clinical stage IIIB

(Perfusion scintigraphy: perfusion defect in the 1st, 2nd, and partially in 6th segment of the right lung. Disturbed perfusion in polycyclic restricted zones in both hilar. Widened mediastinum, predominantly

at the expense of the anterior mediastinum. The perfusion index: 45.5 % to the right lung, the left lung 54.5%).

Complete preoperative examination authenticated the existence of bronchogenic adenocarcinoma of the bronchus of the upper lobe with a diameter of a 70 mm, without mediastinal and hilar lymphadenopathy and with no metastatic changes. Good general condition of the patient, preserved pulmonary function, the absence of co-morbidities and local resectability of the tumor were taken into account when deciding about surgical treatment. According to the TNM classification tumor was estimated as T2b, N0, M0, the disease stage IIA. The thoracotomy was performed by the access through IV intercostal space, with a separate ventilation. Intraoperatively, the existence of tumor in the upper lobe has been verified, which performed a direct invasion into VCS in a length of

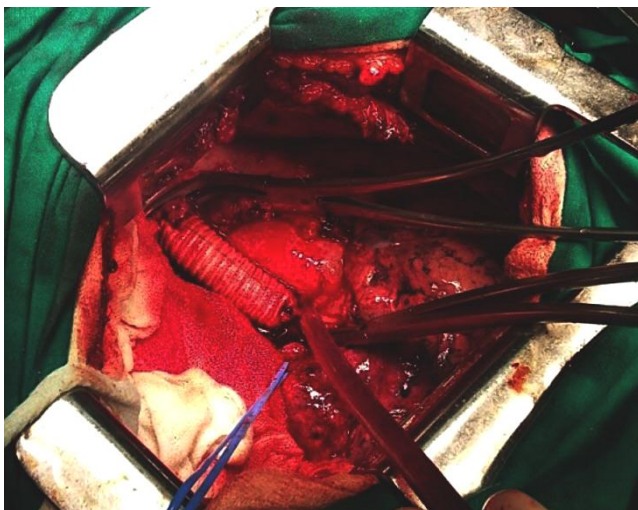


Figure 3. Implantation of the graft at the site of the resected part of the VCS.

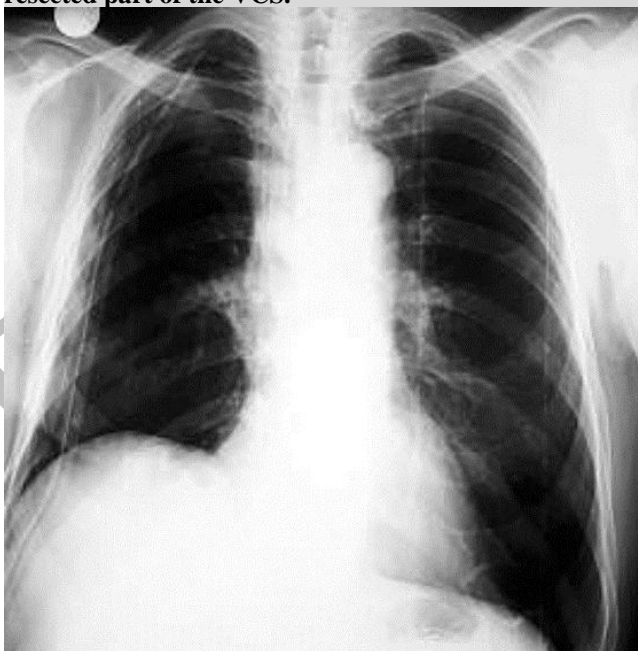


Figure 9. Control radiography: lungs expanded, neat transparency, without pleural effusion, drain in a good position, elevation of right hemidiaphragm (after a ligation of n.phrenicus).

about 2cm extrapericardially, without involvement of the hilar elements. The patient underwent a standard upper lobectomy with mediastinal lymphadenectomy with resection of the VCS, length of about 30 mm. Reconstruction VCS was done by the implantation of vascular graft INTERGARD 16 mm, using the running suture. The time for VCS clamping was about 15 minutes. The postoperative care was orderly, with no significant bleeding and with usual aerostasis duration. The pathological finding confirmed transmural tumor expansion in the VCS segment sized 20x25mm, with no pathologically altered hilar and mediastinal lymph nodes. By using TNM classification, tumor was revised as T4 N0 M0, stage IIIA.

The combination of vascular and thoracic surgical techniques underwent complete tumor resection, the resection of v. cava superior with the implantation of the graft and right upper lobectomy (Figure 3). After the intervention, control radiography was performed (Figure 4).

DISCUSSION

Although many authors have reported favorable results of surgical operations for T4 NSCLC infiltrating a great vessel, surgical indication for combined resection of a great vessel remains controversial [7]. Direct malignant invasion by primary lung tumors or by nodular metastases is the most frequent indication for VCS resection and reconstruction. The reason for the vulnerability of the SVC to tumors arising both in the lung and anterior mediastinum is its anatomy. Primary tumors of SVC, saccular aneurysms or primary malformations and traumatic lesions (iatrogenic, blunt, or penetrating injuries) are infrequent indications [8]. Contraindication to surgical resection and replacement is the presence of SVC syndrome related to unresectable tumors. Kuehn et al. point out that advanced tumor growth with the invasion of the SVC or IVC is generally considered a contraindication for surgery [6]. Other frequent contraindications are completely obstructed SVC with a rich collateral vein circulation and abnormal walls of the proximal veins. The particular attention is demanded to patients undergoing induction chemoradiotherapy [8-9].

Some data suggest that radical resection of lung cancer involving the SVC may result in a permanent cure in carefully selected patients [7]. The good preoperative evaluation and preparation are considered to be very important for the operative mortality and overall survival. Very few studies have dealt with prognostic factors that would be useful in the selection of patients of superior vena cava resection for lung cancer. A follow-up study with 109 participants recorded that both pneumonectomy and complete resection of the SVC with prosthetic replacement were associated with an increased risk of death [10]. It was also found almost six times higher 5-year survival rate among the patients with SVC invasion by metastatic nodes compared to those with SVC invasion by a direct tumor extension (6.6% versus 36%) [10]. The pattern of SVC invasion, as a significant prognostic factor, should also be taken into consideration for therapeutic decision.

In the study of Georgieva et al., on 25 patients preoperative modalities as part of the treatment of lung cancer were analyzed, emphasizing the particular importance of ventilation and perfusion scintigraphy in the evaluation of functional operability [1]. In the past years, the proposed protocol for the treatment of our patient used to comprise: radiological verification, biopsy with histopathology analysis, perfusion, and only then, if scintigram is a pathological, VATS, mediastinoscopy or thoracotomy [1-3].

The new recommendations involve a right thoracotomy in the 4th or 5th intercostal space for upper lobe tumors invading the SVC in the selected patients. Complete median sternotomy is standard approach for tumors of the anterior mediastinum [8]. After pneumonectomy (with or without carinal resection) or lobar resections, proposed modes for SVC resection and reconstruction are: prosthetic SVC replacement, partial resection with running suture, vascular stapler or patch [4,8,10].

Spaggiari et al. found that the mortality rate and 5-year survival rate for patients with superior vena cava invasion were 12% and 21%, respectively [10]. The study with T4 NSCLC recorded thirty-

day mortality 10% with the 5-year survival rate 24% [7,9]. Data from the 40-year-long study emphasized that surgical treatment of lung cancer with infiltration SVC included the risk of developing postoperative complications of 30%, with five-year survival of 21%. Ten-year follow-up study as the part of the previous cited project, underlined that mixed thoracic and vascular surgical treatment reduced postoperative complications by 6%, with 5-year survival of 28% [5-6].

Recommended operative mortality should be less than 10% [4,6,8]. A number of potential complications may be associated with resection and reconstruction of the SVC: anastomotic stenosis (proximal kinking is the most frequent cause of stenosis), graft thrombosis and infection [4,8]. In the study which included 35 persons, operative mortality was 65%, minor complications were developed in 35% of the patients, with 29-month overall survival. The study that was guided by Darteville et al. recorded the excellent survival rate after radical resection of mediastinal tumors invading the SVC: 5-year survival of 60%. Patients with lung cancer show a less favorable prognosis: about 30% at five years [4].

Direct malignant invasion by primary lung tumors or by nodular metastases is the most frequent indication for VCS resection and reconstruction. Despite the major morbidity caused by thoracic tumors involving either the heart or great vessels, most patients are not offered surgical resection.

In our patient grafting and bridging VCS infested structure prevents the development of postoperative vascular complications and improves survival from the beginning of the treatment.

According to our experience the treatment decision for palliative therapy should be based on the patient's clinical findings regardless of technical considerations, concerns regarding postoperative morbidity and mortality, or the insignificant impact on survival.

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