Meeting the Challenges of Centrally Located Non–Small-Cell Lung Cancer

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Surgery continues to advance with the availability of new technology, knowledge and skills gained through experience, and collaboration between specialties. Some tumors that were unresectable in years past are now resectable. Other tumors that we currently consider beyond our ability to remove may be conquered in the near future.

Surgical resection of centrally located T3 and T4 non–small-cell lung cancer (NSCLC) is a rapidly advancing frontier. A combination of several historical factors has enabled clinicians to develop proficiency in this field in a short period of time. First, the number of lung cancer cases in the United States has grown at an epidemic rate. There will be 226,000 new cases of lung cancer in the US in 2014, compared with 117,000 new cases in 1980.[1,2] Without lung cancer screening, 22% of initial presentations have locally advanced (stage III) malignancies. Secondly, growth in the field of lung transplantation since the earliest procedures were performed in the 1980s[3] has produced a generation of thoracic surgeons who are comfortable with airway and arterial anastomosis. Additionally, general thoracic surgeons are comfortable planning operations with cardiopulmonary bypass support due to experience gained in this area through combined cardiothoracic residency programs. Refinement of the tumor-node-metastasis (TNM) lung cancer staging system has allowed homogeneous groupings of cases (ie, T4N0 carinal tumors or T4N0 tumors with vertebral body invasion), which enables comparisons to be made between outcomes, as well as development of integrated treatment algorithms. Finally, broadening expertise in other surgical specialties allows the creation of expert surgical teams capable of reconstructing previously unresectable areas of the mediastinum.

The review by Drs. Backhus and Wood in this issue of ONCOLOGY provides important data on the accuracy of staging and the expected results of surgical resections in patients with centrally located NSCLC.[4] The authors appropriately emphasize that this is a heterogeneous group of patients: Some are resectable with good chances of cure, whereas others are not. Their article is a good reminder that we should be willing to refer these patients to other surgeons in specialized areas if the surgical resection is beyond our comfort zone, based on our level of previous experience.

Centrally located tumors can be characterized by the organ invaded: pericardium and heart, vascular structures, airway, esophagus, or bones. The addition of specialized surgeons to assist in these resections may include those with expertise in cardiac; vascular; spine; ear, nose, and throat; orthopedic; and neurologic procedures. Creation of a custom team starts with the simple question: “What operation would be required to resect this tumor in its present form?” A closely related question is: “Can the expected collateral damage be reduced through shrinkage of this tumor by radiation and/or chemotherapy?” Thus, we generally include neurosurgeons and spine surgeons during the initial evaluation of posterior paravertebral tumors, and cardiac surgeons or vascular surgeons in the initial evaluation of central mediastinal tumors with encroachment on cardiac chambers and great vessels. We also include radiation oncologists, medical oncologists, and pulmonologists in multispecialty tumor boards, to develop treatment plans for these challenging cases.

The data provided about the sensitivity, specificity, and accuracy of individual radiologic tests highlight that no single modality provides sufficient information for surgical planning. We routinely obtain chest positron emission tomography/CT scans, magnetic resonance imaging, and echocardiography during the process of judging the feasibility of surgery, and we find that each modality contributes to the overall picture. High-resolution and three-dimensional CT scans can provide additional views that help in surgical planning. Bronchoscopy, endobronchial ultrasound, and mediastinoscopy are also frequently combined to judge mediastinal nodal involvement and resectability. If the mediastinoscopy shows involvement of the N2 nodes, patients in our hands are treated generally with 3 to 6 cycles of platinum-based chemotherapy and 5,400 rads of radiation.
therapy. There are convincing data that persistent nodal disease after neoadjuvant therapy is a contraindication to surgical resection of central tumors,[5] therefore pathologic restaging of originally positive mediastinal nodes can guide selection of patients who are most likely to benefit from surgery.[6]

The use of cardiopulmonary bypass (CPB) techniques has increased our willingness to resect into the left atrium, the conus of the pulmonary artery, and the lateral wall of the right atrium.[7] CPB also allows resection and reconstruction of the superior vena cava and its tributaries. The addition of CPB often changes the chosen incision from lateral thoracotomy to median sternotomy, hemi-clamshell, or clamshell incision. These frontal approaches to the mediastinum are easily mastered and frequently provide an excellent view of central structures beyond a bulky hilar tumor.

Stepping outside of our individual surgical silos and discovering what our colleagues are doing in other operating departments challenges us to reconsider options in the setting of centrally located NSCLC. For instance, a NSCLC invading the brachial plexus may be considered unresectable by a thoracic surgeon, but a sarcoma invading the brachial plexus may be managed by a forequarter amputation under the care of an orthopedic oncologist. Challenges remain for patients requiring both surgical resection and reconstruction. Technological progress in this setting may provide us with many reconstruction options, just as vertebrectomy became practical once a reliable vertebral replacement became available.

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References:


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