
Postoperative Lung Cancer Surveillance

Who, What, When, and Why?

The appropriate postoperative surveillance strategy after a curative lung resection of a lung carcinoma, as readily demonstrated by the data presented by Johnson et al (see page 99) in this issue and the data of other recent reports,¹² remains an enigma. Who should conduct the surveillance amongst the members of the multidisciplinary team who are now so commonly involved in the management of the lung cancer patient? What routine examinations are appropriate for the surveillance strategy in the asymptomatic postsurgical patient; and indeed, which, if any, of the chosen examinations is truly cost-effective? When, how often, and for how long should the periodic surveillance be carried out? Finally, why is a postoperative surveillance necessary, and what are the actual expectations of the surveillance?

These questions may best be answered in a reversed order. First, the expectations of a surveillance strategy may be founded on the belief that early recognition of asymptomatic local recurrence or distal metastasis is best suited for more effective therapy, greater potential for prolongation of life, and in rare instances, even control of the recurrent disease. There is little factual evidence to support these assumptions. Although the recognition of an early recurrence may afford a longer period of survival, most likely as the result of a lead time bias, the eventual outcome in these patients is no different than those in whom the recurrence was symptomatic at the time of its discovery. Some patients with local recurrence or distant metastasis have had the disease controlled by aggressive therapeutic intervention, but the overall numbers are so few as to be truly insignificant. Second, the early discovery of a new second primary lung tumor that may be resected for cure may be cited.³⁴ The incidence of this occurrence over the long term is approximately 10%, but in a recent review, only one third of these patients were treated with a curative intent.² Thus, the impact on survival of the entire group of patients is small. Third and last, the most compelling reason may be a humanistic one. The routine periodic visit establishes and fosters a bonding between the cancer patient and his or her physician that lends essential support to the patient in the trials and tribulations that may occur in the future. This alone should be significant enough to advocate long-term continued surveillance of the postoperative patient.

Next is the question of how often should the patient be seen. The common practice of seeing the patient often (three or four times a year) for the first several years, and then less frequently thereafter (usually only once a year), belies the last two of the aforementioned reasons for the surveillance. Most importantly, the bond is weakened and, as is well documented, the possibility of occurrence of a new second primary does not decrease with time.⁵ Therefore, if one accepts the concept of postoperative surveillance, it should continue at least twice if not three times a year for as long as the patient survives.

Assuming the patient is asymptomatic, what routine studies other than a history, physical examination, and minimal routine laboratory studies should be done? One is hard put at present to suggest anything other than posteroanterior and lateral chest radiographs. These are the best and least expensive tools for early recognition of a new lung primary occurrence or the suggestion of an asymptomatic local recurrence within the chest. The more sophisticated and costly CT scan may be called for if a questionable lesion is found but certainly is not indicated as routine. Furthermore, the routine investigation for an asymptomatic distant metastasis is no more successful in the postoperative patient than in the preoperative patient, a practice that has been found wanting in numerous studies in the literature.⁶ Moreover, as also frequently reported, negative brain, bone, or other scans have no predictive value as to the future occurrence of such metastases.⁶ The cost-effectiveness of such studies, even in patients who have had advanced disease resected, although not recorded in the literature, can be reasonably assumed to be negative. Even the cost-effectiveness of routine chest radiographs has not been established!

Last, the answer as to who should conduct these
periodic examinations is perhaps the most equivocal of all. Any member of the team may be chosen; however, most surgeons believe that they should be the ones to conduct the postoperative surveillance since they have been responsible for the major therapeutic intervention in these patients. However, this is a local issue that can be resolved readily. It remains prudent to emphasize that whoever is chosen, he or she must assume the responsibility of seeing the patient throughout the patient’s entire course. The least desirable course of action is to pass the patient from one team member to another without continued surveillance by the primary responsible physician. When this occurs, the humanistic supportive bond is broken, and much has been for naught.

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REFERENCES

Monitoring Tissue Oxygenation
The Search for the Grail

Generally, it is believed that tissue hypoxia plays a significant role in the development of organ failure in critically ill patients and is a major factor in the pathogenesis of the multiorgan dysfunction seen in the systemic inflammatory response syndrome (SIRS). This makes intuitive sense because adequate oxygenation is required for the efficient production of adenosine triphosphate (ATP), the major reservoir of energy required for the maintenance of cellular function. Unfortunately, a generally accepted method of assessing the adequacy of tissue oxygenation has not been available. Thus, many hypotheses regarding the putative importance of tissue hypoxia as a cause of disease, as well as possible benefits of augmenting tissue oxygen delivery and thus correcting the hypoxia, have been impossible to test.

Oxygen transport, measured as the product of cardiac output and the arterial O2 content, is a commonly evaluated clinical indicator of adequate tissue oxygenation. However, it should be obvious that an adequate bulk transport of oxygen by the cardiovascular system does not guarantee its delivery to the critical tissues of the body. Factors that determine the regional distribution of blood flow as well as events that may alter the normal control of the microvascular bed prevent any simple translation of changes in O2 transport into similar quantitative or even qualitative changes in O2 delivery. Traditional “global” estimates of tissue hypoxia such as lactate levels and mixed venous PO2 are nonspecific and insensitive to regional abnormalities, which, except in the setting of hypotensive shock, are the most likely problem. Even direct measurements of individual tissue PO2, were they clinically available, would probably be of little help. Studies suggest that oxidative phosphorylation can be optimally carried out at a cellular PO2 in the 2 to 3 mm Hg range.1 This low operating level would make any change in tissue PO2 too subtle to use as a clinical indicator of a correctable problem.

Techniques that directly appraise the state of tissue energetics would be an optimal approach and such methods do exist. Magnetic resonance spectroscopy and near-infrared spectrophotometry can directly measure the energy charge of living tissue. However, at the moment, both techniques have far too many technical limitations to be clinically useful. Another marker of the onset of significant anaerobic metabolism is the development of tissue acidosis. Anaerobic glycolysis results in the accumulation of H+ ions and a fall in tissue pH. With this in mind, Grum and coworkers, in search of an early indicator of bowel ischemia in patients undergoing abdominal aortic aneurysm resection, found that a rise in the intraluminal Pco2 mirrored similar changes in the bowel wall and signaled the onset of tissue acidosis.2 A subsequent modification of this technique, measurement of the intraluminal-arterial Pco2 difference, as used in the paper by Duke and colleagues in this issue of CHEST (see page 174), appears to increase the specificity of the measurement. While this technique monitors only the portion of the GI tract in which the luminal Pco2 is being assessed, there is some rationale to choosing the GI tract as a