Postoperative Radiation Therapy after Surgery for Lung Cancer

When technically and medically possible, surgery is often the best upfront therapy for non-small cell lung cancer (NSCLC). In some circumstances, radiation therapy after surgery can increase the chance of controlling cancer at its primary site and in regional lymph nodes. Let’s discuss some of those settings.

First, radiation therapy is strongly considered in patients who undergo surgery, though for whom cancer is not totally removed (or “resected”). We typically refer to this situation as surgery with “positive margins,” meaning one of two things: 1) The surgeon was visually unable to remove all of the tumor – referred to as a “gross positive margin.” The term “gross” refers to the unresectable residual disease being readily seen without the assistance of a microscope – similar to the phrase “gross anatomy,” referring to the physical study of the body’s muscles, bones, and internal organs as viewed with the naked eye upon dissection. 2) The surgeon was visually able to remove the entire tumor (“gross negative margin” or “gross total resection”), but upon microscopic analysis, the pathologist found cancer right up to the edge of the specimen. This is referred to as a microscopically positive margin – indicating the very high likelihood that on the remaining edge of lung tissue adjacent to the area where the gross tumor was removed, there are cancer cells left behind.

In these two situations of positive margins, we often recommend postoperative radiation therapy, aimed at eradicating remaining cancer. The area of a positive margin, whether it is gross or microscopic, may often be readily localized by the radiation oncologist, enabling focused radiation therapy to that area. As well, for patients that were good candidates to have surgery, such patients typically are in good enough general health and have enough pulmonary reserve to withstand some inflammation or scarring of the lung related to radiation therapy.

The second key instance in which radiation therapy is considered after surgery is the circumstance of completed resected cancer with pathologic evidence of cancer spread to the mediastinal lymph nodes – the lymph nodes in the center of the chest. Studies over the past few decades have suggested a cancer control benefit for patients with mediastinal lymph node positive disease if they undergo postoperative radiation therapy directed at the mediastinum (central chest lymph node region). For patients with less extensive fully resected cancer at the time of surgery, postoperative radiation therapy is typically not recommended. Among patients without positive lymph nodes in the mediastinum (thus earlier stage disease), retrospective studies have suggested that postoperative radiation therapy may be detrimental. However, these cancer patients with potentially worse outcomes after radiation therapy for limited disease were treated in an era with inferior techniques and technology.

There are many other situations in which patients find themselves with questions about postoperative radiation therapy. For example, after a “wedge” resection, the question often comes up about the potential benefit of postoperative radiation therapy. Typically, a
"lobectomy" is the preferred surgical procedure for patients with non-small cell lung cancer. In a lobectomy, an entire “lobe” of the lung is removed – depending on whether it is the left or right lung, the lobectomy removes one-third to one-half of the lung volume on that side. Studies have compared lobectomy to lesser procedures such as the wedge resection, in which only the known cancer and a small surrounding area around it are removed, though found higher rates of recurrence with the wedge resection.

Given the historic higher rates of recurrence with wedge resection, the question may arise as to whether postoperative radiation therapy directed at the surgical bed would reduce the risk of cancer recurrence. Generally in this situation, postoperative radiation therapy is not recommended for a number of reasons. First, with modern surgical techniques and intraoperative pathologic analysis, wedge resections likely carry a lower risk of recurrence than in years past. The Japanese for example have published recent series of patients in which the rates of recurrence after wedge resection were quite low. Second, for patients unable to medically tolerate a complete lobar resection, the additional side effects of lung directed radiation therapy may not be worth the further decrease in recurrence risk that radiation therapy affords.

Altogether, the recommendation for postoperative radiation hinges on its ability to significantly reduce the risk for cancer recurrence in situations where it is not likely to cause significant enough damage to remaining lung that a patient’s quality of life is hindered. In situations of positive margins and cancer spread to the lymph nodes of the mediastinum, radiation therapy may confer a significant overall benefit to the patient.