



## Radiologist performance in the detection of lung cancer using computed tomography

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The treatment options for non-small cell lung cancer (NSCLC) are based mainly on the stage (extent) of the cancer, but other factors, such as a person's overall health and lung function, as well as certain traits of the cancer itself, are also important. For these cancers, malignant cells are seen on sputum cytology but no obvious tumor can be found with bronchoscopy or imaging tests. They are usually early-stage cancers. Bronchoscopy and possibly other tests are usually repeated every few months to look for a tumor. If a tumor is found, treatment will depend on the stage. Because stage 0 NSCLC is limited to the lining layer of airways and has not invaded deeper into the lung tissue or other areas, it is usually curable by surgery alone. No chemotherapy or radiation therapy is needed. If you are healthy enough for surgery, you can usually be treated by segmentectomy or wedge resection (removal of part of the lobe of the lung). Cancers in some locations (such as where the windpipe divides into the left and right main bronchi) may be treated with a sleeve resection, but in some cases they may be hard to remove completely without removing a lobe (lobectomy) or even an entire lung (pneumonectomy). For some stage 0 cancers, treatments such as photodynamic therapy (PDT), laser therapy, or brachytherapy (internal radiation) may be alternatives to surgery. If your cancer is truly stage 0, these treatments should cure you. If you have stage I NSCLC, surgery may be the only treatment you need. This may be done either by taking out the lobe of the lung that has the tumor (lobectomy) or by taking out a smaller piece of the lung (sleeve resection, segmentectomy, or wedge resection). At least some lymph nodes in the lung and in the space between the lungs will also be removed and checked for cancer.

Segmentectomy or wedge resection is generally an option only for very small stage I cancers and for patients with other health problems that make removing the entire lobe dangerous. Still, most surgeons believe it is better to do a lobectomy if the patient can tolerate it, as it offers the best chance for cure. For people with stage I NSCLC that has a higher risk of coming back (based on size, location, or other factors), adjuvant chemotherapy after surgery may lower the risk that cancer will return. But doctors aren't always sure how to determine which people are likely to be helped by chemo. New lab tests that look at the patterns of certain genes in the cancer cells may help with this. Studies are now being done to see if these tests are accurate.

After surgery, the removed tissue is checked to see if there

are cancer cells at the edges of the surgery specimen (called positive margins). This could mean that some cancer has been left behind, so a second surgery might be done to try to ensure that all the cancer has been removed. (This might be followed by chemotherapy as well.) Another option might be to use radiation therapy after surgery. If you have serious health problems that prevent you from having surgery, you may get stereotactic body radiation therapy (SBRT) or another type of radiation therapy as your main treatment. Radiofrequency ablation (RFA) may be another option if the tumor is small and in the outer part of the lung. People who have stage II NSCLC and are healthy enough for surgery usually have the cancer removed by lobectomy or sleeve resection. Sometimes removing the whole lung (pneumonectomy) is needed. Any lymph nodes likely to have cancer in them are also removed. The extent of lymph node involvement and whether or not cancer cells are found at the edges of the removed tissues are important factors when planning the next step of treatment. After surgery, the removed tissue is checked to see if there are cancer cells at the edges of the surgery specimen. This might mean that some cancer has been left behind, so a second surgery might be done to try to remove any remaining cancer. This may be followed by chemotherapy (chemo). Another option is to treat with radiation, sometimes with chemo.

Even if positive margins are not found, chemo is usually recommended after surgery to try to destroy any cancer cells that might have been left behind. As with stage I cancers, newer lab tests now being studied may help doctors find out which patients need this adjuvant treatment and which are less likely to benefit from it. If you have serious medical problems that would keep you from having surgery, you may get only radiation therapy as your main treatment. Treatment for stage IIIA NSCLC may include some combination of radiation therapy, chemotherapy (chemo), and/or surgery. For this reason, planning treatment for stage IIIA NSCLC often requires input from a medical oncologist, radiation oncologist, and a thoracic surgeon. Your treatment options depend on the size of the tumor, where it is in your lung, which lymph nodes it has spread to, your overall health, and how well you are tolerating treatment. For people who are not healthy enough for surgery, radiation therapy, which may be combined with chemo, is often used. If surgery, radiation or chemoradiation are not considered tolerable treatment

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options, immunotherapy with pembrolizumab (Keytruda) may be considered as the first treatment. Stage IIIB NSCLC has spread to lymph nodes that are near the other lung or in the neck, and may also have grown into important structures in the chest. These cancers can't be removed completely by surgery. As with other stages of lung cancer, treatment depends on the patient's overall health. If you are in fairly good health you may be helped by chemotherapy (chemo) combined with radiation therapy (known as chemoradiation). Some people can even be cured with this treatment. If the cancer stays under control after 2 or more treatments of chemoradiation, the immunotherapy drug durvalumab (Imfinzi) can be given for up to a year to help keep the cancer stable. Patients who are not healthy enough for this combination are often treated with radiation therapy alone, or, less often, chemo alone. If surgery, radiation, or chemoradiation are not considered tolerable treatment options, immunotherapy with pembrolizumab (Keytruda) may be considered as the first treatment. These cancers can be hard to treat, so taking part in a clinical trial of newer treatments may be a good option for some people.

Stage IV NSCLC is widespread when it is diagnosed. Because these cancers have spread to distant parts of the body, they are very hard to cure. Treatment options depend on where and how far the cancer has spread, whether the cancer cells have certain gene or protein changes, and your overall health.

Lung cancer, the leading cause of cancer death worldwide, can be survived if early detection through screening programs occurs. Radiologist performance plays a pivotal role in lung cancer detection. Purpose: To measure the level of radiologists' performance in lung cancer detection. We also explore radiologists' performance in cancer specialized and nonspecialized centers. Methodology: Thirty radiologists read sixty chest computed tomography (CT) scans. Thirty cases had surgically or biopsy-proven lung cancer and thirty were cancer-free cases. The cancer cases were validated by four expert radiologists who located the malignant lung nodules. Reader performance was evaluated by calculating sensitivity, location sensitivity, specificity, and area under the receiver operating

characteristic curve (AUC). In addition, sensitivity at fixed specificity = 0.794 was computed from each reader's estimated receiver operating characteristic curve. Results: The radiologists had a mean sensitivity of 0.749, sensitivity at fixed specificity of 0.744, location sensitivity of 0.666, specificity of 0.81 and AUC of 0.846. Radiologists in the specialized and nonspecialized cancer centers had the following (specialized, nonspecialized) pairs of values: sensitivity = (0.80, 0.719); sensitivity for fixed specificity = (0.752, 0.740); location sensitivity = (0.712, 0.637); specificity = (0.794, 0.82) and AUC = (0.846, 0.846). Conclusion: The efficacy of radiologists in our study was comparable to other studies. Furthermore, AUC outcomes were similar for specialized and nonspecialized cancer center radiologists, suggesting they have similar discriminatory ability and that the higher sensitivity and lower specificity for specialized-center radiologists can be attributed to them being less conservative in interpreting case images