Radiologic Diagnosis of Extrathoracic Metastases to the Lung

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Because many types of cancers metastasize to the lungs, early detection may affect both tumor staging and treatment planning. On the other hand, it is also important to refrain from subjecting patients to procedures that

The article, "Radiologic Diagnosis of Extrathoracic Metastases to the Lung," by Woodard, Dehdashti, and Putnam provides a very interesting summary of a complex topic. Their classification of primary tumor sites into five groups by behavior and likelihood of pulmonary metastases is useful. The potential applications of positron emission tomography (PET) in this setting may occasionally prove practical; however, at present, PET scanning is beyond the reach of most practice settings.

I would like to supplement this article with a somewhat different approach to the topic of pulmonary metastatic disease in the hope of providing useful and more specific management guidelines for the clinician. Certain key questions based on treatment strategies should be addressed in this patient setting: How might the detection of pulmonary metastases modify therapy, including both primary treatment and salvage approaches? How should initial and follow-up thoracic surveillance be structured? Does the detected pulmonary abnormality fit the behavior of the primary tumor?

**Pulmonary Metastatic Patterns**

Table 1 summarizes the common radiographic patterns of metastatic disease encountered on plain films and computed tomographic (CT) scans.

Sarcomas that metastasize to the lung are characterized by well-defined nodular lesions usually found close to the pleural surfaces. Some of these deposits may excavate, and occasionally the excavation leads to a pneumothorax. Adenocarcinoma is the cell type found with virtually all bilateral lymphangitic metastatic neoplasms. Squamous cell metastases to the lung fall between the sarcomas and adenocarcinomas in radiographic appearance, and their behavior depends on the primary tumor site. This histology defines most of the cavitary metastatic (and primary lung) neoplasms. Head and neck squamous cell lung metastases occur with more advanced-stage primary tumors and tend to be located in the upper portions of the lungs.[1,2] One could assume, as an operating principle, that a solitary lung module in a patient with a stage I head and neck cancer is not a metastatic tumor but more likely is a second primary lung cancer.

Although exceptions occur, metastatic disease from primary extrathoracic neoplasms tends to display predictable radiologic patterns, which should be placed in the perspective of the patient's status when detected. Clinicians and radiologists should review the presumed lung metastases skeptically within the context of the patient's primary tumor and data similar to that summarized in Table 1.

Infrequently, pulmonary metastatic disease will be the initial expression of the patient's neoplasm, with the primary tumor site occult. In this setting, a very limited, tailored search for the occult primary tumor should be launched based on the appearance of the metastasis, its histology, and the patient's age and sex. Even on postmortem examinations, nearly 45% of primary tumors cannot be located in this type of metastatic presentation.[3]

Woodard et al simplify their approach to grouping primary tumors and their metastatic expressions, which, with a few noteworthy exceptions, can be applied in the majority of cases:

**Choriocarcinomas** Pulmonary metastases from choriocarcinomas in women are not as critical in the staging/treatment process as those to the liver or brain. Following treatment, lung abnormalities may persist on CT scans in the face of normal titers and can be clinically set aside as unimportant observations.

**Testicular Cancers** These neoplasms should be divided into seminomas and nonseminomas. Seminomas behave in a more predictable manner, moving from one lymph nodal station to the next, rarely exhibiting pulmonary metastases. Nonseminomatous testicular tumors commonly spread to the thorax, with the most dramatic expression occurring with the teratocarcinomas.

**Gastrointestinal Neoplasms** Tumors from the stomach and pancreas most often exhibit...
lymphangitic patterns of spread, whereas colonic primaries produce nodular lung metastases after the regional lymph nodes and liver are first involved. The exceptions are carcinoid and anal-rectal tumors. The latter neoplasms may occasionally spread to the lungs without first involving the liver, as they may extend to the hemorrhoidal venous plexus and then to the lungs directly.

**Ovarian Tumors** As with testicular neoplasms, ovarian tumors and their metastatic expressions can be grouped as epithelial and nonepithelial types. The more common epithelial tumors spread along the peritoneal surfaces and may extend to the thorax late in the course of disease, usually appearing as pleural effusions. The less common nonepithelial neoplasms may metastasize to the lungs with hematogenous, nodular lesions.

**Imaging Surveillance Strategies**

The choice of imaging procedure in the staging and follow-up of a cancer patient should be governed by the behavior of the primary tumor and how the results would affect management of the patient's disease. The more sensitive CT studies should be reserved for those primary tumors for which unsuspected pulmonary metastatic disease would significantly alter primary treatment. The use of thoracic CT in posttreatment follow-up should also be dictated by similar management questions, combined with probability estimates.[4]

Rarely, if ever, will any imaging study guarantee that the thoracic abnormality is metastatic. Numerous differential entities mimic metastatic lung disease, from infections to treatment effects. Histologic or temporal verification of metastatic intrathoracic disease is an implicit obligation of the clinician and radiologist.

In summary, the design of an imaging detection-surveillance program requires a tailored approach, influenced by the behavior of the primary tumor, treatment options, and the sensitivity of the imaging technique. A balanced, cost-effective approach to imaging and interpretation by a radiologist familiar with the complex subject of metastatic lung disease will yield the best results for the patient.

**References:**


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