Radiography nomography: Utility of a calculator in rational preoperative decision making for subsolid pulmonary nodules

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Central Message

A preoperative nomogram for predicting invasive adenocarcinoma in subsolid radiographic lesions may have utility in guiding the extent of pulmonary resection.

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The ground-glass opacity and the subsolid nodule are increasingly recognized radiographic representations of lung adenocarcinoma. The histology most commonly present in these radiographically defined lesions are adenocarcinomas of the lepidic histology spectrum, ranging from the preinvasive adenocarcinoma in situ to minimally invasive adenocarcinoma and to the more invasive lepidic predominant adenocarcinoma.¹ A breadth of literature has demonstrated radiographic-pathologic associations among these interesting tumors with general correlation of radiographic ground glass to preinvasive histology and with general correlation of radiographic solid components to invasive pathology.²⁻⁴ A clinical tool for the precise preoperative prediction of invasive histology has not been developed and could have important clinical utility.

In this issue of the *Journal*, Jin and colleagues⁵ have constructed and validated a nomogram with robust discrimination for calculating the risk of *invasive* pulmonary adenocarcinoma among a single-institution retrospective cohort of 273 patients who underwent resection of a peripheral subsolid lung nodule. A major advantage of a prediction tool such as this one is its implications for determining the extent of resection of radiographic subsolid pulmonary nodules, a proportion of which will contain invasive adenocarcinoma and a proportion of which will contain noninvasive or minimally invasive lesions. In this series, for example, 54% of subsolid nodules were pathologically invasive adenocarcinomas for which anatomic resection such as lobectomy should be offered, and the remainder were benign, preinvasive, or minimally invasive lesions for which sublobar resection could be *considered*. Whereas no randomized trials have evaluated the long-term oncologic outcomes of sublobar resection for these preinvasive and minimally invasive adenocarcinoma lesions, resection of these entities is associated with 100% disease-free survival (in studies including both lobectomy and sublobar

resections),^{1,6,7} and a number of retrospective studies have demonstrated excellent long-term survival outcomes with sublobar resection for adenocarcinomas that were predominantly ground glass radiographically.^{8,9} Supporting the rationale for this type of preoperative decision-making for subsolid nodules (lobectomy vs sublobar resection) is that preoperative needle biopsy and intraoperative frozen section generally cannot sufficiently distinguish invasive from preinvasive disease, secondary predominantly to sampling error.^{1,10} However, as the accuracy of frozen section for this disease improves, as it has in select centers,⁷ the clinic utility of such a nomogram will diminish.

In Jin and colleagues' study,⁵ the nomogram for predicting the probability of invasive adenocarcinoma was constructed from variables including computed tomography attenuation, vascular convergence, pleural tag, spiculation, lesion size, and solid proportion. Several of these variables, in other institutions and countries, are not universally reported features of cross-sectional chest imaging. Practical implementation of such a nomogram requires experienced chest radiologists participating in nomogram point assignment, and the generalizability of this test to other institutions and countries requires validation. Of note, this nomogram was constructed from a dataset composed of only surgically resected lesions, and it will be imperative

to validate these methods among a larger cohort of individuals with subsolid pulmonary nodules treated both surgically and nonsurgically, ideally in a prospective trial.

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