



Breaking through the chest wall: the prognostic significance of rib invasion in lung cancer surgery

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Approximately 5% of patients with non-small cell lung cancer (NSCLC) have chest wall invasion. The American Joint Commission on Cancer 8th edition classifies all tumors with chest wall invasion as T3, regardless of whether the tumor involves the parietal pleura only, the intercostal muscles, or the ribs, yet the degree of chest wall invasion could have important therapeutic and prognostic implications (1). In this issue of the *Journal of Thoracic Disease*, Yutaka *et al.* provide valuable insight into the prognostic impact of rib invasion in NSCLC patients undergoing chest wall resection (2).

Their study included 42 patients who underwent *en bloc* pulmonary and chest wall resection for T3 NSCLC over a 13-year period. Of these, 18 patients had pathologically confirmed rib invasion. The authors found that rib invasion was associated with a significantly worse prognosis. As compared with patients without rib invasion, patients with rib invasion had worse 5-year overall (44.7% *vs.* 81.3%, $P=0.0222$) and 5-year disease-free survival rates (44.4% *vs.* 77.4%, $P=0.0114$). On multivariable analysis, rib invasion was found to be independently associated with a 6-fold increase rate of mortality. In addition, rib invasion was also associated with higher rates of local (22.2% *vs.* 8.3%) and distant (33.3% *vs.* 12.5%) metastasis, as compared with patients without rib invasion. These findings are consistent with prior studies assessing the prognostic impact of rib

invasion (3-5).

The mechanism by which rib invasion affects survival is not fully understood. It is possible that the presence of rib invasion is a simply a surrogate marker for more aggressive tumor biology, as suggested by the authors. Indeed, patients with rib invasion had larger tumors, higher rates of lymph node metastasis, and were more likely to have aggressive histological features, such as lymphatic invasion and pleural invasion. Despite the small sample size, this study has potentially important prognostic and therapeutic implications. In particular, patient selection is key. As compared with patients with N0 disease, patients with T3 (chest wall invasion) and N2 disease have a poor survival rate (6). Therefore, it's well-established that pathologic assessment of mediastinal lymph nodes is essential. Nonetheless, challenges remain.

Though Yutaka and colleagues demonstrated the prognostic significance of the degree of chest wall invasion, accurate preoperative assessment is challenging. The sensitivity of static computed tomography (CT) and magnetic resonance imaging (MRI) for detecting chest wall invasion is about 65%, with wide variation in the literature assessing their performance (CT sensitivity, 38–87%; MRI sensitivity, 63–90%) (7-9). Therefore, use of a pretreatment T descriptor based on the degree of preoperative chest wall invasion to guide patient care decisions has limitations.

While surgery alone is unlikely to offer patients the highest probability of long-term survival, the details of the ideal multimodal treatment plan are incompletely understood. While the authors mention that some patients received postoperative chemotherapy or radiation therapy, the specific details of these treatments and their potential impact on survival outcomes are not discussed. Importantly, the time period of the study preceded the current era of chemoimmunotherapy and the use of targeted therapies for resectable NSCLC, which is particularly important as Asian populations tend to have higher rates of actionable mutations as compared with Western populations (10). Therefore, the findings in this study have limitations with regards to generalizability. Ideally, reevaluation of T descriptors to include degree of chest wall invasion would be assessed prospectively as part of the next iteration of the International Association for the Study of Lung Cancer Staging Project.

In conclusion, this study provides further evidence of the prognostic significance of pathologically confirmed rib invasion among NSCLC patients. Because it's associated with a higher risk of recurrence and cancer-specific mortality, rib invasion should be considered in treatment planning and prognostication. Future studies are needed to define the optimal management strategies for NSCLC patients with rib invasion, including proper patient selection and the role of various neoadjuvant and adjuvant treatment strategies for potential surgical candidates.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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