Impact of anterior tumor location on survival after resection of lung cancer invading the thoracic inlet (Pancoast tumors)

Objective:
Superior sulcus tumors are a challenging subset of non-small cell lung carcinomas (NSCLC) presenting with invasion of the thoracic inlet. These tumors are generally treated with neoadjuvant therapy to facilitate resection and optimize the chances of achieving a complete microscopic resection (R0). In this study, we aimed to determine if the location of the tumor along the first rib had an impact on survival.

Methods:
We performed a review of 92 consecutive patients undergoing surgery for NSCLC invading the thoracic inlet between 01/1996 and 06/2021. The thoracic inlet was divided into 5 predefined zones (JTCVS 2012;144:72-80). Zone 1 and 2 were characterized by anterior tumors extending along the vessels, subclavian vein (zone 1) or subclavian artery (zone 2). Zone 3, 4, and 5 were characterized by posterior tumors extending along the pulmonary sulcus at the level of T1 vertebra (zone 3) or below (zone 4), or extending into the axilla (zone 5). Response to induction therapy was defined as pathological complete response (PCR) with the absence of any residual disease (0%) or major pathological response (MPR) with the presence of 10% or less of residual disease.

Results:
Patients were on average 61 years old (32-75), predominantly males (54%), with right sided tumors (57%). All but 2 patients underwent induction therapy: chemoradiation (n=78, 85%), radiation alone (n=7, 8%), chemotherapy alone (n=4, 4%), or chemo-immunotherapy (n=1, 1%). Tumors were localized in zone 1 (n=10, 11%), zone 2 (n=11, 12%), zone 3 (n=18, 20%), zone 4 (n=44, 48%), or zone 5 (n=9, 10%). Lobectomy was performed in 86 patients (93%). Chest wall resection included rib 1 alone (n=2, 2%), ribs 1-2 (n=20, 22%), ribs 1-3 (n=33, 36%), ribs 1-4 (n=28, 30%), or ribs 1-5 (n=9, 10%). En bloc vertebral resection was performed in 39 patients (42%), subclavian artery resection in 11 (12%), subclavian vein resection in 10 (11%), and subclavian vein resection with superior vena cava in 1 (1%). Median hospital length of stay was 13 days (5 – 227). 30-day and 90-day mortality was 1.1% (n=1) and 5.4% (n=6), respectively. R0 resection was achieved in 79 patients (86%), 81% in zone 1-2 and 87% in zone 3-5 (p=0.4). PCR was observed in 33 patients (36%), 33% in zone 1-2 and 37% in zone 3-5 (p=0.3). MPR was observed in 61 patients (66%), 57% in zone 1-2 and 70% in zone 3-5 (p=0.3). After a median follow-up of 5.8 years (0.8-24), 49 patients died for an overall survival of 48% (95% CI 38%-59%) at 5-year. The 5-year survival was influenced by: completeness of resection (51% in R0 vs 29% in R1, p=0.02); pathological response (69% in PCR vs 56% in MPR vs 31% in residual disease >10%, p=0.03), tumor location (56% in zone 3-5 vs 22% in zone 1-2, p=0.01), and age (61% in <60 years vs 37% in >60 years, p=0.007). Zone 1-2 remained an independent predictor of worse survival in multivariate analysis (HR 2.5, 95%CI 1.3-4.9, p=0.006). The benefit of pathological response on 5-year survival was more significant in zone 1-2 than in zone 3-5 (Figure).

Conclusions:
The anatomical location of the tumor affects survival after resection of lung cancers invading the superior sulcus. The improved survival associated with pathological response to neoadjuvant therapy was most particularly evident in tumors located anteriorly in the thoracic inlet. This may reflect the added technical complexity of anterior tumor resections and the anatomically close margins in this area.
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