

Intraoperative Challenges After Induction Therapy for NSCLC: Impact of Nodal Disease on Technical Complexity

Objective

Neoadjuvant therapy has been theorized to increase the complexity of pulmonary resections for non-small cell lung cancer (NSCLC); however, specific factors contributing to intraoperative challenges after induction therapy haven't been well-described. We aimed to characterize the impact of nodal involvement and nodal treatment response on surgical complexity after neoadjuvant therapy.

Methods

A prospectively maintained institutional database was used to identify patients who were treated with neoadjuvant therapy followed by anatomic lung resection for cN+ NSCLC between 2010-2020. Pathologic lymph nodes were identified, and patients were classified as having N1 vs N2 disease. Further, in order to evaluate impact of size reduction in pathologic hilar nodes, thoracic radiologists measured histologically confirmed malignant station 10/11 nodes before and after receipt of induction therapy. Percent reduction in size was noted. Operative reports were used to identify presence of technical challenges specifically related to nodal disease. We evaluated the influence of extent of nodal response on surgical challenges, particularly those involving the pulmonary artery (PA), as well as the impact of location of pathological nodes on such intraoperative findings. Categorical outcomes were compared using the chi-squared test.

Results

126 patients met inclusion criteria, with 38 (30.2%) having N1 and 88 (69.8%) having N2 disease. The majority of patients were treated with neoadjuvant chemotherapy (85.7%, n=108), while chemoradiation (n=9) and targeted therapy (n=9) were less common. In cases performed for patients with N1 disease, we found that 7/38 (18.4%) required proximal PA control, while this was necessary in only 3/88 (3.4%) of N2 cases (p=0.004). Likewise, sleeve resection and arterioplasty were needed more frequently during resection of N1 disease (6/38, 15.8%) vs N2 disease (1/88, 1.1%, p<0.001, Table). Further, for pathologically positive hilar lymph nodes, median reduction in nodal size was 30%. Nodal reduction ≥30% (n=19) was associated with more frequent intraoperative technical challenges than when nodal reduction was <30% (n=17). In these cases, nodal disease led to more frequent: intraoperative change in vascular approach (31.6% vs 11.8%), need for proximal PA control (21.1% vs 17.6%), unexpected sleeve or arterioplasty (21.1% vs 5.9%), inability to resect node from PA (21.1% vs 17.6%), and tear from node stuck to PA (5% vs 0%).

Conclusions

The presence of N1 disease was associated with greater likelihood of requiring complex surgical maneuvers compared to N2 disease after induction therapy. Similarly, substantial treatment response of hilar nodes was associated with increased intraoperative technical challenges. Recognizing such factors enables surgical teams to engage in safer operative planning for these frequently complex cases.

	Cases with N1 disease (N=38)	Cases with N2 disease (N=88)	P
Node unable to be removed from PA	5 (13.1)	6 (6.8)	0.247
Node stuck to PA causing tear	1 (2.6)	0	0.127
Node forces change in approach to vasculature	7 (18.4)	7 (8)	0.086
Intrapericardial PA control due to node	3 (7.8)	2 (2.3)	0.138
Proximal PA control due to lymph node	7 (18.4)	3 (3.4)	0.004
Extent of surgery changed due to node	2 (5.2)	2 (2.3)	0.380
Arterioplasty/sleeve due to lymph node	6 (15.8)	1 (1.1)	<0.001

PA = pulmonary artery