Editorial

Robotic resection of stage III lung cancer: an international retrospective study

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The minimally invasive approach in thoracic surgery has proven advantages in terms of reduced postoperative pain, shorter immune response, quicker resumption of daily activities, and better aesthetic and functional result (1-3). The minimally invasive surgery despite it is recognized by the majority of thoracic surgeons still has a slow diffusion due to the technical difficulty and the long-lasting learning curve (4-7). The result of this situation is that a large part of thoracic surgeons still prefers an open traditional approach to perform a lung anatomical resection. Surgical manipulation also exerts a depressing cell-mediated immunity, which is manifested through the alteration in the cell, activation and function of lymphocytes and monocytes. The magnitude of these effects is proportional to the extent of the surgical procedure.

One of the major criticisms of minimally invasive surgery was due to inadequate mediastinal lymph node dissection compared with thoracotomy procedures, usually related to greater operator discomfort and a partial view due to the position of the camera, in particular to perform radical lymphadenectomy. This concern over inferior oncologic outcomes has so far contributed to the slow adoption of minimally invasive surgery techniques. However, robot-assisted thoracic surgery (RATS) using the da Vinci system represented a technological evolution of the video-assisted thoracic surgery (VATS) procedure leading to a better view of the operative field (3D instead of 2D), a simpler use of the instruments, and more precise movements, even superior to the human hand (8-11). To address the limitations of conventional thoracoscopy, a tele-surgical system was developed to offer the surgeons several benefits, which include three-dimensional, high-definition imaging, and a greater free movement of the surgeon using wristed instruments and the master-slave surgical cart, and computer-assisted scaling down of motion and reduction of hand-related tremors (da Vinci system, Intuitive Surgical, Sunnyvale, CA, USA). This could offer to the surgeon an innovative approach to resect and stage lung cancer with a more precise dissection and with theoretically better oncological results. These improvements become particularly useful in case of advanced disease with lymph nodes involvement allowing an easier and safer N1 and N2 lymph node dissection (12-14). In the literature, different series showed higher number of harvest lymph nodes in RATS compare to VATS and similar to open surgery (13,14,15-18). Also overall pathologic lymph node upstaging for RATS (14.8–24%) was similar to the larger open series (14.3–24.6%) and better than conventional VATS (10.6–11.9%) (13,14,16-18).

However, the most common indication for minimally invasive approach in lung cancers with either VATS or RATS, are early stage non-small cell lung cancer (NSCLC) (stage I and II) (19). Despite some series report the use of robotic surgery in patients with both initial or locally advanced NSCLC (8-13), the results of this approach specifically for stage III disease have been described only in very limited retrospective studies (11,20-24), showing anyhow similar oncological outcomes between open and minimally invasive groups, in term of post-operative outcome and survival even after chemotherapy.

Veronesi *et al.* recently published a retrospective multicentre study describing one of the largest series of patients (n=223) with pN2 NSCLC and carcinoid undergoing RATS (25). In this study the author showed acceptable perioperative outcomes with only 2.7% of converted cases to open surgery due to bleeding demonstrating the safety and feasibility of the procedure, even in patients underwent induction chemotherapy. One of the major difficulty related to RATS is the lack of perception that can make surgery particularly challenging especially in the case of chemotherapy or radiotherapy, with higher risk of intra operative complications. However, in this series they highlighted that large tumor size and >2 positive lymph nodes were associated with higher risk of conversion to open surgery despite unexpected mediastinal nodal invasion as well as pre-operative treatments were not the major cause of thoracotomy conversion. In this important series, the estimated 3-year survival in NSCLC patients was 61.2%, showing an excellent oncological result even if it could be related by the fact that most of the patients (n=142/223; 63.7%) had occult N2 disease and only 34 (15%) patients underwent induction therapy.

Also in our recent series of 339 patients who underwent RATS for clinical stages I–II NSCLC, we showed an excellent overall lymph node upstaging (17.6%) and 58% of 5-year stage specific survival for occult pN2 patients (n=28) confirming that mediastinal lymph node dissection during RATS adequately assesses lymph node stations leading to excellent oncologic results (19).

In conclusion, RATS lung resection for advanced NSCLC is safe and feasible both in terms of post-operative outcome and oncological results. However, these results require prospective studies (ongoing our multicenter prospective study for stage IIIApN2 NSCLC) and further testing on a larger population to be validated.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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