Peer Review File
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REVIEWER A:

The authors focused on the incidence and clinical impact of prolonged air leakage (PAL) in robotic anatomic pulmonary resection. They concluded that robotic lung resection was a safe technique, advantageous compared to traditional open thoracotomy in terms of PAL occurrence reduction. And they mentioned that it was a valid alternative to manual VATS.

The authors showed (1) Incidence and predictive factors of PAL in patients treated with robotic lung resection, (2) PAL onset after robotic surgery vs. open surgery and VATS, (3) PAL in patients undergoing robotic sublobar resection, and (4) PAL management in robotic thoracic surgery.

Comment 1:
Lines 205-280
However, the authors did not mention intraoperative innovations for PAL in RATS.

Response 1:
We thank the reviewer for evaluating our manuscript. Certainly, when facing robotic lung resection all the intraoperative principles to prevent prolonged air leaks that are commonly used in open and videothoracoscopic surgery should be applied as well, in particular in those patients who have risk factors for PAL development. Nevertheless, there are some specific innovations that are peculiar of robotic surgery, such as the use of robotic staplers that we reported in the previous version of the manuscript (lines 255-264 of the revised version), and the improved dexterity of robotic arms to complete parenchymal sutures when needed to accomplish adequate aerostasis. Moreover, a recent publication of a Japanese group reported the results of a comparative study between the new robotic vessel sealing system (VSS) and common staplers for the prevention of PAL. The authors demonstrated that the use of VSS to complete fused fissures was able to significantly lower the occurrence of overall postoperative

complications, and allowed benefits on the onset of PAL (0% vs 10%, p=0.058) and reduction of surgery costs due to the lower number of stapler recharges used in this group of patients. In the light of these considerations, we revised the manuscript accordingly (lines 265-271).

Comment 2:

Lines 244-254

Lines 255-265

Lines 266-280

Also, the authors described several contents that had nothing to do with RATS.

Response 2:

We agree with the reviewer that this section was dispersive because of reporting a lot of data about general PAL management that is shared by all patients regardless of the surgical technique (open thoracotomy, VATS or RATS). Therefore, we aimed to revise this section about 'PAL management in robotic thoracic surgery' in deep, focusing on specific measures for the perioperative management in robotic experience (lines 238-254). Moreover, we decided to maintain a paragraph describing the technique and the results of autologous blood patch for the treatment of postoperative PAL, as it reflects the current practice of our robotic surgical group (lines 272-287).

Comment 3:

Lines 197-200

The authors mentioned that "although a significantly higher proportion of patients in the RATS group received a complex segmentectomy with respect to VATS and open surgery groups (45% vs. 15% vs. 22%, p<0.001), the incidence of PAL in the former group was remarkably lower than that of other techniques (3.9% vs. 12.5% with VATS, and 13.3% with thoracotomy).

Is it possible that the percentage of RATS is increasing only because complex segmentectomy has risen in recent years? The proportion of conventional procedures such as VATS and thoracotomy may appear smaller because there are many cases of non-Complex segmentectomy.

Response 3:

According to the comment of the reviewer, we revised this paragraph (lines 219-230). In the cited paper, overall, still a higher number of segmentectomies were conducted by means of open surgery than RATS and VATS. Moreover, complex segmentectomies represented 37.5% of all procedures at the end of the study period. This information was stated in the text. Our message is that the number of robotic cases and complex segmentectomies grew proportionally over the years, and RATS seemed to be the most suitable approach to perform complex resections with a lower incidence of perioperative complications because of its well-known technical characteristics.

Comment 4:

Lines 61-62

Lines 168-170

The authors showed that "robotic lung resection is a safe technique, advantageous compared to traditional open thoracotomy in terms of PAL occurrence reduction, and it is a valid alternative to manual VATS."

Also, the authors demonstrated that "the meta-analyses by Agzarian, Ng, and Aiolfi confirmed the superiority of MIS in preventing PAL onset after major lung resections with respect to open surgery, even though no reliable difference was identified between RATS and VATS (23–25)."

The authors should mention how the authors interpret the results of this meta-analysis.

Response 4:

We included a comment about the interpretation of the results of the metanalyses, as requested. We stated that they should be interpreted with caution because of high heterogeneity of the studies included, and more prospective trials are needed to confirm the results (lines 187-194).

REVIEWER B:

I read it with great interest. I think this paper is important for clinical practice of respiratory surgery and useful for the safety of surgery.

Comment 1:

In Table 3, authors compares the incidence of pulmonary leakage by each surgical procedures, but I wonder if the incidence of pulmonary leakage in open-chest surgery is too high.

Response 1:

We thank the reviewer for the positive comments about our manuscript. Data reported in Table 3 were extracted by large series and meta-analyses from the recent literature. The incidence of PAL in open surgery cases was constant across the studies.

Comment 2:

In addition, VATS and RATS are compared, and RATS is considered to include those in the early stages of introduction. Comparing proficient thoracotomy, VATS and early RATS lacks objectivity. Consideration is desirable on this point.

Response 2:

We agree with the reviewer on this point. The impact of the learning curve on the incidence of perioperative complications including PAL might have an important role in this issue. We cited in the previous version of the manuscript the results of the study by Cao et al, who did not identify the completion of a learning curve of more than 20 anatomical resections as a predictive factor for severe (i.e. > grade III) complications (lines 143-150 of the revised version). In contrast, another of study by Su et al, that showed a significant improvement in the prevention of PAL after 50 cases of robotic thoracic surgery (lines 151-157 of the revised version). Therefore, a definitive evaluation on the role of learning curve on the incidence of PAL is challenging.

We revised the paragraph according to these remarks (lines 158-162). We aimed to cite the results of the ROMAN study, that compared the perioperative results of RATS and VATS lobectomy performed by experienced surgeons without difference of PAL incidence in the groups.

REVIEWER C:

This narrative review focused on prolonged air leak (PAL) following robotic-assisted thoracic surgery (RATS) lung resection. The authors presented that RATS allowed a significant reduction in the occurrence of PAL as compared to open surgery, and that PAL incidence in RATS and VATS resulted comparable. In addition, complex segmentectomy performed by RATS might have better outcomes in the occurrence of PAL when compared to open surgery or VATS due to the RATS platform and RATS staplers thus RATS may be more suitable than VATS for complicated procedures. PAL is associated with a generally worse outcome with a more complicated postoperative course and prolonged hospital stay and increased costs. Therefore, this narrative review is logical and interesting, and discussed a hot topic in minimal invasive surgery for lung resection. However, the following points should be addressed.

Comment 1:

There is a strong correlation between surgeon experience and decreasing postoperative PAL following RATS. Whereas surgical technique contributes to PAL following RATS, surgeons early in RATS experience may want to consider selecting patients with fewer risk factors for PAL. The reviewer think that this is one of biases in retrospective studies for RATS comparing with other approaches.

Response 1:

We agree with the reviewer on this point. The impact of the learning curve on the incidence of perioperative complications including PAL might have an important role in this issue. We cited in the previous version of the manuscript the results of the study by Cao et al, who did not identify the completion of a learning curve of more than 20 anatomical resections as a predictive factor for severe (i.e. > grade III) complications (lines 143-150 of the revised version). In contrast, another of study by Su et al, that showed a significant improvement in the prevention of PAL after 50 cases of robotic thoracic surgery (lines 151-157 of the revised version). Therefore, a definitive evaluation on the role of learning curve on the incidence of PAL is challenging.

We revised the paragraph according to these remarks (lines 158-162). We aimed to cite the results of the ROMAN study, that compared the perioperative results of RATS and VATS lobectomy performed by experienced surgeons without difference of PAL incidence in the groups.

Finally, we stated that possible selection bias of the retrospective series that were analyzed in our paper is a major limitation of the study (lines 299-303).

Comment 2:

Miyajima et al. reported the safety of using the RATS vessel sealing system as an alternative to the use of staples for interlobar fissure division thanks to advantages of RATS; the unobstructed field of view provided by high precision 3D images and the excellent operability provided by the robot arms (JTCVS Techniques 2022). In addition, the reviewer consider that RATS may make it technically easier to perform complex surgical procedures including suturing lung parenchymal defects which often lead to persistent air leaks.

Response 2:

We thank the reviewer for signaling this brand-new paper reporting the results of robotic vessel sealing system (VSS) for interlobar fissure division. The system demonstrated to be effective for PAL prevention and allowed an overall cost reduction. We included dedicated comments about the impact of VSS and robotic parenchymal sutures (lines 265-271 and 251-254).

Comment 3:

The authors should describe limitation of this narrative review. Data included in the present analysis were extrapolated from retrospective cohort studies, and bias might also exist due to the retrospective nature of the study.

Response 3:

As required by the reviewer, we stated that possible selection bias of the retrospective series that were analyzed in our paper is a major limitation of the study (lines 299-303).

Comment 4:

The cost may be a real issue when comparing RATS with other approaches. Could the authors discuss this issue?

Response 4:

According to the comment of the reviewer, we included a comment on the economic burden of robotic surgery. We cited the results of our previous study that demonstrated the economical sustainability of RATS compared to VATS and open surgery along with its better perioperative outcomes (lines 94-100).