Editorial Commentary

Should we keep on doing robotic surgery to treat lung cancer in 2020?

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Spaggiari *et al.* (1) have highlighted the absolute necessity of evaluating our surgical practices constantly modified by technological progress. Spaggiari *et al.* (1) conducted an internal audit as a sharing experience in which they compared the long-term outcomes of patients after lobectomy by robotic-assisted thoracoscopic surgery (RATS) or by open surgery for a cN0 non-small cell lung cancer (NSCLC) between 2011 and 2016.

Spaggiari is recognized as an expert in robotic thoracic surgery and his learning curve has been completed for many years. We would like to congratulate these authors on their impressive results without any postoperative death, and with a very low rate of postoperative morbidity. Major complications, i.e., grade 3A or higher according to Clavien-Dindo classification, occurred in only 3.8% of patients in the open group and in 4.5% in the robotic group. These results are better than those of recent systematic reviews and meta-analyses (2,3). Concerning long-term outcomes, Spaggiari *et al.* reported excellent results. Their 5-year disease risk recurrence was 24.9% (95% CI, 17.4–34.8%) in the open surgery group and 24.6% (95% CI, 17.0–34.8%) in the RATS group. Their 5-year overall survival (OS) was 83.2% (95% CI, 74.8–89%) in the open surgery group and 86.1% (95% CI, 76.6–92%) in the RATS group. No significant difference was observed between the groups either in terms disease free survival (DFS), HR 1.09 (95% CI, 0.83–1.42), P=0.55, or OS, HR 0.86 (95% CI, 0.63–1.19), P=0.36. Spaggiari *et al.* concluded that RATS lobectomy was a safe and feasible oncologic technique with acceptable DFS and OS compared to open surgery.

However, these results may be fortuitous for the detractors of robotic surgery and raise the question of whether we should keep on doing robotic surgery to treat lung cancer. What are the benefits for patients, of the robotic approach? According to Spaggiari *et al.*, there is no difference in the rate of early complications and no benefits concerning long-term outcomes between robotic and open approaches. We should also add that robotic surgery is not only more costly but also impacts department organization.

Surgery is the cornerstone treatment (4) for early-stage NSCLC. Our first goal as thoracic surgeons is to try to cure patients of their cancer, with the best short-term and long-term outcomes possible. Technologic innovations as video-assisted thoracoscopic (VATS) and RATS must help us to perform better, not worse resection. This issue has become even more relevant since the recent United States Food and Drug Administration (FDA) warning against the oncologic effectiveness of the robot (5) in April 2019, following two publications (6,7). Furthermore, in gynecologic cancer the robotic approach has been associated with a lower rate of long-term survival. In these articles, authors reported a lack of surgeon training without detailing the technical consequences and therefore the operating procedures. However, this is not the case of this work due to robotic

expertise.

We regret that Spaggiari's article takes the form of a "brief report" because we are still hungry and our curiosity is aroused. Indeed, based on the current literature, medical and economic data will determine the future of robotic surgery over the next few years. We would have liked to have more detail concerning: (I) the selection of patients for the robotic approach; (II) the robotic approach with the Si and Xi platform; (III) lymph node dissection, with the number of lymphatic areas harvested, the number of lymph nodes resected; details of postoperative outcomes; 90-day mortality; long-term survival data—DFS and OS—for each stage, and also some financial information concerning the surgical costs of the procedure and the hospital stay. Moreover, in the discussion section, the authors could have developed the real advantages of the robotic approach supporting their findings with more evidence.

Let us just remember that in the literature, for early-stage NSCLC, VATS and RATS allowed better short outcomes compared to open surgery, without significant differences in most reports between those two approaches, except for the operating duration (2,8-15) and the cost in favor of VATS (16,17). O'Sullivan *et al.* (3) published in 2018 the first systematic review and meta-analysis and concluded that RATS lobectomy significantly improved the short-term outcomes of patients more than VATS or open lobectomy. After RATS lobectomy, compared to open lobectomy, there was an improvement in short-term outcomes, with fewer complications, OR 0.67 (95% CI, 0.58–0.76) P<0.00001, lower 30-day mortality, OR 0.53 (95% CI, 0.33–0.85) P=0.08, and a shorter length of hospital stay, weighted mean difference (WMD) –1.4 days (95% CI, –1.96 to –0.85) P<0.00001. After RATS lobectomy, compared to VATS lobectomy, there was lower 30-day mortality, OR 0.61 (95% CI, 0.45–0.83) P=0.001.

Meanwhile, the literature has grown concerning long-term outcomes with 5-year OS and DFS, which are major criteria of oncologic quality to evaluate our surgical practices. Ng *et al.* (2) published the most recent and extensive systematic review and meta-analysis in which they compared outcomes after RATS, VATS and open lobectomy. Long-term outcomes were not different when VATS was compared to RATS, with 5-year OS, OR 0.79 (95% CI, 0.47–1.33), P=0.38, and 5-year DFS OR 0.71 (95% CI, 0.44–1.14), P=0.16.

In the beginning, there was open thoracotomy, but today, there are VATS and RATS. Together, there are three surgical approaches but two resection concepts for lung lobectomy. Compared to our VATS experience—anterior approach-fissureless technique—RATS allows us to mimic open surgery techniques. The robotic platform allows the thoracic surgeon to perform a lobectomy, as she/he would have done by an open approach. Conversely, the fissureless approach in VATS lobectomy is a necessary adaptation of a surgical technique, that could be considered as an oncological misconception (18). This could be one of the reasons explaining the lack of difference concerning OS and DFS between RATS and open surgery. Another reason could be that long-term survival is not only influenced by the surgical approach. Spaggiari *et al.* reported their robotic experience between 2011 and 2015. Since 2011, our specialty has evolved. We have seen the development of fast recovery protocols or ERAS© protocol, with many benefits for patients. In these protocols, the minimally invasive surgical approach is just one of the stones of this edifice. And maybe, the benefits are greater in patients treated by an open approach compared to a minimally invasive surgical approach as VATS or RATS and these benefits may have influenced DFS and OS.

Another interesting question would be which patients and which stages could benefit from the robotic approach? How far can we go? Because, with better short-term outcomes and with good DFS and OS compared to open thoracotomy, we are convinced of the added value provided by the robotic approach, for early-stage NSCLC, but even more for loco regionally extended NSCLC. With its technical characteristics, as 3D high definition and stable vision, and with the dexterity allowed by the Endowrist® system, more complex cases could be operated on with the robotic platform. Thus, the robotic platform could be used for all stages and complex resections as segmentectomies, sleeve and locally advanced tumors with clear short-term outcomes. The robotic approach could be used to perform complete lymph node dissection in locally advanced NSCLC. For a stage III NSCLC, with cN2 involvement, complete mediastinal lymph node dissection could be performed more easily by RATS than by VATS (19,20). RATS could be preferred to VATS to perform complete hilar and lobar lymph node dissection for cN1 NSCLC with the technical advantages of the robotic platform (20) and better short-term outcomes with fewer adverse events.

Today, in the light of recent results from systematic reviews and meta-analyses, there is a clear benefit of robotic surgery compared to open surgery in the short-term outcomes of lung cancer patients. Long-term outcomes however are not different because, the robotic

platform allows us to perform the same quality of oncologic resection. Thanks to a meticulous learning of the technique, longer than in the literature reports, and thanks to the experience sharing of our community, better resection could be done with the robot, with better short-term outcomes compared to open thoracotomy and extended indications could be managed safely and with good oncologic results. We clearly think that evidence will arise in the next few years to support robotic surgery as the optimal minimally invasive platform for lung resection.

So, Yes, we should keep on doing Robotic Surgery to treat lung cancer in 2020.

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Footnote

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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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