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Directions for robotic surgery in the treatment of thoracic diseases in Brazil

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A minimally invasive surgical approach is the recommended option for the treatment of lung cancer, especially in the early stages.[1] The first form of minimally invasive surgery was video-assisted surgery, which began to be employed in the treatment of thoracic diseases in the early 1990s. In the last decade, robotic surgery has emerged as another minimally invasive surgical option. In comparison with video-assisted surgery, the use of robotic thoracic surgery has been growing faster, especially in more developed countries.[2] Although the first reports of the use of robotic surgery in the treatment of thoracic diseases in Brazil were published in 2011, the feasibility of the robotic approach in the surgical treatment of patients with lung cancer was not demonstrated until 2016, when Terra et al.[3] reported their initial experience with the technique. Although not yet widespread, the use of robotic thoracic surgery has been growing in Brazil. In the field of thoracic surgery, the main applications of robotic surgery are in the treatment of lung cancer and mediastinal tumors. This issue of the JBP includes the largest studies to date presenting the Brazilian experience with robotic surgery in the treatment of tumors of the thymus[4] and lung cancer.[5]

Terra et al.[4] report their initial experience in a sample of 18 patients with tumors of the thymus who underwent robotic surgery at a total of seven centers in Brazil. The authors reported technical aspects and results, such as operative time, extent of resection, length of hospital stay, and postoperative complications. There were no intraoperative accidents, and no cases were converted to video-assisted or open surgery. The most relevant results were the median drainage time and median length of hospital stay (only 1 and 2 days, respectively). There were no postoperative deaths, and only 3 cases presented complications (elevation of the hemidiaphragm, in 2, and chylothorax, in 1). Of the 18 patients, only 1 had positive surgical margins, receiving adjuvant chemotherapy and radiotherapy after surgery. The follow-up period was too short to provide estimates on cancer outcomes. With this report of their initial experience,[4] in the form of a case series, the authors demonstrated that robotic thoracic surgery for the treatment of thymic tumors is feasible and safe for use in Brazil.

The most common application of robotic surgery in thoracic diseases is in the treatment of lung cancer, due to the high incidence of the disease. In another article published in this issue of the JBP, Terra et al.[5] report the 40-month experience of six Brazilian institutions, with a collective total of 154 patients, using robotic surgery for the resection of lung cancer. The morbidity rate was 20.4%, and the mortality rate was 0.5%. From an oncological point of view, the surgical resection was categorized as complete in 97.4% of the cases and as uncertain, due to the involvement of mediastinal lymph nodes, in only 2.6%. Although the follow-up period was short (mean, 326 days), the overall survival rate during follow-up was 97.5%. These results demonstrate that, in Brazil, robotic surgery for the treatment of lung cancer patients can be performed properly and safely, which consolidates its status as an acceptable option for minimally invasive surgery.

Although the studies detailed above describe initial experiences in Brazil,[4,5] the morbidity and mortality rates reported are very similar to those reported in various international studies,[6] demonstrating that robotic surgery results in pleural drainage times and hospital stays are shorter than those reported for other techniques.[7] Oh et al.[8] published results from a study of patients who underwent lobectomy in the USA. The authors compared three techniques: robotic surgery, video-assisted surgery, and thoracotomy. In comparison with thoracotomy, robotic surgery was found to result in lower postoperative complication rates, shorter hospital stays, and lower postoperative mortality.[8] In addition, the results suggest that robotic thoracic surgery maintains the basic principles of surgical resection of cancer. We must bear in mind that, despite its novelty, the robotic technique should never be allowed to change the principles of the surgical treatment of cancer. Studies with longer follow-up periods have reported oncological results similar to those obtained with thoracotomy and video-assisted surgery.[9] Kneuertz et al.[10] suggested that the robotic technique is more well suited to mediastinal lymphadenectomy than is the video-assisted technique, which gives the former a great oncological advantage.

Technological advances, together with the increasing experience of surgeons, have expanded the indications for robotic thoracic surgery.[11] Even in Brazil, the use of robotic thoracic surgery has been growing rapidly and in an organized manner. Training and certification processes play a key role in the safe and effective dissemination of the robotic technique. Although initial results from the Brazilian experience indicate that we are on the right track, some obstacles need to be overcome. The high cost of incorporating new technologies is always a big issue. However, with the improvement of training, education, and standardization of procedures, the results look quite promising. Kneuertz et al.[12] demonstrated that, for lung cancer resection, robotic surgery is more cost-effective than is thoracotomy. The greater number of centers in different regions in Brazil is also an important step for increasing the access to and democratization of the

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technique, not only for surgeons who are interested in applying the technique but also for the patients who can benefit from its use.

The outlook for robotic thoracic surgery in Brazil seems to be positive, provided that careful training, qualification, and standardization of procedures are maintained. With these precautions, the safety and effectiveness of robotic surgery will be enhanced, contributing to improved cost-effectiveness and democratization of access to these technological advances.

REFERENCES

1. Ettinger DS, Wood DE, Aggarwal C, Aisner DL, Akerley W, Bauman JR, et al. NCCN Guidelines Insights: Non-Small Cell Lung Cancer, Version 1.2020. J Natl Compr Canc Netw. 2019;17(12):1464-1472.
2. Rajaram R, Mohanty S, Bentrem DJ, Pavey ES, Odell DD, Bharat A, et al. Nationwide Assessment of Robotic Lobectomy for Non-Small Cell Lung Cancer. Ann Thorac Surg. 2017;103(4):1092-1100. https://doi.org/10.1016/j.athoracsur.2016.09.108
3. Terra RM, Araujo PH, Lauricella LL, Campos JR, Costa HF, Pêgo-Fernandes PM. Robotic pulmonary lobectomy for lung cancer treatment: program implementation and initial experience. J Bras Pneumol. 2016;42(3):185-190. https://doi.org/10.1590/S1806-37562015000000212
4. Terra RM, Milanez-de-Campos JR, Haddad R, Trindade JRM, Lauricella LL, Bibas BJ, et al. Robotic thoracic surgery for resection of thymoma and tumors of the thymus: technical development and initial experience. J Bras Pneumol. 2020;46(1):e20180315. https://doi.org/10.1590/1806-3713/e20180315
5. Terra RM, Bibas BJ, Haddad R, Milanez-de-Campos JR, Nabuco-de-Araujo PHX, Teixeira-Lima CE, et al. Robotic thoracic surgery for non-small cell lung cancer: initial experience in Brazil. J Bras Pneumol. 2020;46(1):e20190003. https://doi.org/10.1590/1806-3713/e20190003
6. Farivar AS, Cerfolio RJ, Vallières E, Knight AW, Bryant A, Lingala V, et al. Comparing robotic lung resection with thoracotomy and video-assisted thoracoscopic surgery cases entered into the Society of Thoracic Surgeons database. Innovations (Phila). 2014;9(1):10-15. https://doi.org/10.1097/imi.0000000000000043
7. Emmert A, Straube C, Buentzel J, Roever C. Robotic versus thoracoscopic lung resection: A systematic review and meta-analysis. Medicine (Baltimore). 2017;96(35):e7633. https://doi.org/10.1097/MD.0000000000007633
8. Oh DS, Reddy RM, Gorrepati ML, Mehendale S, Reed MF. Robotic-Assisted, Video-Assisted Thoracoscopic and Open Lobectomy: Propensity-Matched Analysis of Recent Premier Data. Ann Thorac Surg. 2017;104(5):1733-1740. https://doi.org/10.1016/j.athoracsur.2017.06.020
9. Park BJ, Melfi F, Mussi A, Maisonneuve P, Spaggiari L, Da Silva RKC, et al. Robotic lobectomy for non-small cell lung cancer (NSCLC): long-term oncologic results. J Thorac Cardiovasc Surg. 2012;143(2):383-389. https://doi.org/10.1016/j.jtcvs.2011.10.055
10. Kneuertz PJ, Cheufou DH, D'Souza DM, Mardanzai K, Abdel-Rasoul M, Theegarten D, et al. Propensity-score adjusted comparison of pathologic nodal upstaging by robotic, video-assisted thoracoscopic, and open lobectomy for non-small cell lung cancer. J Thorac Cardiovasc Surg. 2019;158(5):1457-1466.e2. https://doi.org/10.1016/j.jtcvs.2019.06.113
11. Zirafa CC, Romano G, Key TH, Davini F, Melfi F. The evolution of robotic thoracic surgery. Ann Cardiothorac Surg. 2019;8(2):210-217. https://doi.org/10.21037/acs.2019.03.03
12. Kneuertz PJ, Singer E, D'Souza DM, Abdel-Rasoul M, Moffatt-Bruce SD, Merritt RE. Hospital cost and clinical effectiveness of robotic-assisted versus video-assisted thoracoscopic and open lobectomy: A propensity score-weighted comparison. J Thorac Cardiovasc Surg. 2019;157(5):2018-2026.e2. https://doi.org/10.1016/j.jtcvs.2018.12.101