Editorial

Non-intubated uniportal video-assisted thoracoscopic surgery for carinal sleeve resection—is surgical process almost completed?

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Fortunately, Bernhard von Langenbeck was wrong when he gave the opening speech at the first congress of German society of surgery in 1872 and declared the surgical process to be almost completed (1).

Only a few years later, in 1881, Themistokles Gluck demonstrated the feasibility of tracheal resection and end-to-end anastomosis for the first time in dogs (2). First description of tracheal resection and airway reconstruction in humans were published by Johannes Soerensen in 1915 (3). He described his and Glucks' experiences in treatment of two individuals with malignant stenosis of trachea. Both patients underwent tracheal sleeve resection and in both cases a R0 margin was achieved. In a 24-month follow-up no recurrence was observed.

During the 20th century several surgeons developed opportunities to improve mobilisation of the trachea to enable an extended resection without intense tension at the anastomosis. At the same time techniques of covering the anastomosis with tissue flaps were developed (4). Especially the work of Hermes C. Grillo was a landmark in progress of tracheal surgery. Grillo and colleagues proposed a new technique, which allows to resect half of the trachea and still facilitated a sufficient end-to-end anastomosis (5). One of the latest innovations is the increasing use of extracorporal membrane oxygenation, to enable full respiratory support in tracheal surgery (6). Nevertheless, even in specialized centers for thoracic surgery, tracheal resection for carcinoma still is a rare condition (4) and tracheal surgery and particularly carinal sleeve resection remain to be some of the most challenging procedures in thoracic surgery (7).

However, the progress of minimal invasive surgery also affected the field of tracheal surgery. This included tracheal resection and reconstruction by mediastinoscopic approach (8) as well as video-assisted thoracoscopic surgery (VATS) (9). The first case report of circumferential resection and primary end-to-end anastomosis of the trachea, operated via VATS, was published already by Nakanishi in 2005 (10). Several surgeons adopted and enhanced this approach, up to the latest reports of carinal sleeve resection carried out by uniportal VATS (9).

Jianxing He and colleagues showed some interesting improvement in minimal invasive surgery for tracheal resection in the last years. Additionally, their case reports evidently reveal the progress of advanced thoracic surgery. In five publications (11-15), published between November 2015 and November 2016, they show the development from resection of a tracheal mass with three-port-VATS under non-intubated anaesthesia (11), followed by VATS with carinal reconstruction (12) and ending in uniportal VATS for tracheal resection in a spontaneous breathing patient (15). Especially the successful carinal sleeve resection via VATS is an excellent performance of minimal invasive surgery.

In their report of VATS for carinal sleeve resection (12) they describe the case of a 47-year-old female with a tracheal adenoid cystic carcinoma causing cough, wheezing and shortness of breath. A tracheal tumor, blocking the opening

of the right main bronchus, was found in bronchoscopy and He *et al.* decided for a four-port-VATS approach for resection of the carcinoma and tracheal reconstruction. This surgery was performed under ventilation with cross-field endobronchial tube. After resection of the tracheal tumor a new carina was formed of the remnants of the bilateral main bronchus. When running suture of left main bronchus and trachea was finished, cross-field ventilation was changed to endobronchial tube, which was re-inserted to the left main-stem bronchus. At last, the right main bronchus was sutured to the distal trachea by running stitches.

We have to affirm, that He and colleagues not only provide insight in the evolution of surgical improvement in a specialized center for thoracic surgery, but also published excellent results in treatment of tracheal carcinoma and airway reconstruction by carinal sleeve resection .

Usually, patients in case reports, presenting new surgical techniques, are a well selected group of individuals. In this particularly case all patients were younger than 46 years old and in quite good physical condition. Only limitation was the circumstance that they showed restricted respiratory function, due to tracheal tumor (11-15). This situation might be explained by the fact that adenoid cystic carcinoma is a rare entity itself, but one of the most frequent tumors of trachea (7). Mean age of patients with adenoid cystic carcinoma is between 44 and 48 years (16,17) and no severe comorbidities in these young patients are mentioned in several publications (7,16,18).

Despite the fact, that considerations for numeric reduction of ports in VATS or surgery with spontaneous ventilation anaesthesia are comprehensible, a lack of evidence remains. Most single center experiences of tracheal resection and specifically carina sleeve resection are presented in case reports (11-15,19). Only few studies with more than 100 patients are published (17,20). In both surveys the time for data collection was more than 40 years. It might be recommendable to design a multicentre study to collect data for a systematic and long-term follow-up, being able to prove advantages and disadvantages of different types of minimal invasive surgical approaches and non-intubated surgery.

In summary of the outlined development, the authors of this editorial do not believe that surgical process is yet almost completed and we are looking forward to further innovations.

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Footnote

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

References

1. Becker HM. Eröffnungsansprache des Präsidenten. In: Hartel W, editor. Wandel der Chirurgie in unserer Zeit. Langenbecks Archiv für Chirurgie. Berlin: Springer 1993:1-9.
2. Gluck T, Zeller A. Die prophylaktische Resektion der Trachea. Arch Klin Chir 1881;26:427-36.
3. Soerensen J. Zwei Fälle von Totalexstirpation der Trachea wegen Karzinom. Archiv Laryngol Rhinol 1915;29:188-204.
4. Grillo HC. Development of tracheal surgery: a historical review. Part 1: Techniques of tracheal surgery. Ann Thorac Surg 2003;75:610-9.
5. Grillo HC, Dignan EF, Miura T. Extensive resection and reconstruction of mediastinal trachea without prosthesis or graft: an anatomical study in man. J Thorac Cardiovasc Surg 1964;48:741-9.
6. Rinieri P, Peillon C, Bessou JP, et al. National review of use of extracorporeal membrane oxygenation as respiratory support in thoracic surgery excluding lung transplantation. Eur J Cardiothorac Surg 2015;47:87-94.
7. Porhanov VA, Poliakov IS, Selvaschuk AP, et al. Indications and results of sleeve carinal resection. Eur J Cardiothorac Surg 2002;22:685-94.
8. Herrmann D, Schoch M, Hecker E. Videomediastinoskopische Tracheateilresektion und Rekonstruktion. Zentralbl Chir 2017;142:S67-112.
9. Gonzalez-Rivas D, Yang Y, Stupnik T, et al. Uniportal video-assisted thoracoscopic bronchovascular, tracheal and carinal sleeve resections†. Eur J Cardiothorac Surg 2016;49 Suppl 1:i6-16.
10. Nakanishi K, Kuruma T. Video-assisted thoracic tracheoplasty for adenoid cystic carcinoma of the mediastinal trachea. Surgery 2005;137:250-2.
11. Li S, Liu J, He J, et al. Video-assisted transthoracic surgery resection of a tracheal mass and reconstruction of trachea under non-intubated anesthesia with spontaneous breathing. J Thorac Dis 2016;8:575-85.
12. He J, Wang W, Li J, et al. Video-assisted thoracoscopic surgery tracheal resection and carinal reconstruction for tracheal adenoid cystic carcinoma. J Thorac Dis 2016;8:198-203.

13. Peng G, Cui F, Ang KL, et al. Non-intubated combined with video-assisted thoracoscopic in carinal reconstruction. J Thorac Dis 2016;8:586-93.
14. Liu J, Li S, Shen J, et al. Non-intubated resection and reconstruction of trachea for the treatment of a mass in the upper trachea. J Thorac Dis 2016;8:594-9.
15. Guo M, Peng G, Wei B, et al. Uniportal video-assisted thoracoscopic surgery in tracheal tumour under spontaneous ventilation anaesthesia. Eur J Cardiothorac Surg 2017;52:392-4.
16. Albers E, Lawrie T, Harrell JH, et al. Tracheobronchial adenoid cystic carcinoma: a clinicopathologic study of 14 cases. Chest 2004;125:1160-5.
17. Honings J, Gaissert HA, Weinberg AC, et al. Prognostic value of pathologic characteristics and resection margins in tracheal adenoid cystic carcinoma. Eur J Cardiothorac Surg 2010;37:1438-44.
18. Pearson FG, Thompson DW, Weissberg D, et al. Adenoid Cystic Carcinoma of the Trachea. Ann Thorac Surg 1974;18:16-29.
19. Nakanishi R, Yamashita T, Muranaka K, et al. Thoracoscopic carinal resection and reconstruction in a patient with mucoepidermoid carcinoma. J Thorac Cardiovasc Surg 2013;145:1134-5.
20. Gaissert HA, Grillo HC, Shadmehr MB, et al. Long-term survival after resection of primary adenoid cystic and squamous cell carcinoma of the trachea and carina. Ann Thorac Surg 2004;78:1889-96; discussion 1896-7.

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