



New Technology Applied to Laryngo-Tracheal Surgery

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Abstract

3D models can be used for preoperative planning in case of complex tracheobronchial or laryngo-tracheal surgery or for teaching purpose for medical student or to train surgeons, residents and fellows. We can expect a widespread use of 3D printer technologies in thoracic surgery not only for tracheal surgery. In our opinion becoming familiar with these new technologies is important for the evolution of surgery.

Keywords: Tracheal surgery; 3D printing; Training in surgery; Thoracic surgery; laryngo-tracheal surgery

Case Presentation and Discussion

The laryngo-tracheal surgery is performed only by few thoracic surgery departments with a specific experience. Unfortunately, gaining surgical experience in animal or cadaveric models is a difficult option, limited to some academic realities, not easily accessible to all. In eighties Charles W. Hull commercialized the first 3D printing tools: the process involved the creation of a 3D model using computer reconstruction which was then printed by deposition of layer by layer material. The 3D printing has been used in different fields of medicine in the last years [1]. In the last few years, 3D printed models have been reported for planning of complex tracheal and subglottic reconstruction. Different materials and printer are available on the market (Figure 1). In particular, soft materials were to simulate the resection and reconstruction of trachea (Figure 2), main bronchi or larynx to train residents, fellows, medical students and as a model for patient's education before surgery [2,3]. In clinical practice after an initial experience, this technique could become an alternative to endoscopy for decision making before surgery and to choose which technique and the extension of tracheal resection the patient needs during surgery [4].

In thoracic surgery, but not only, biomaterial 3D printing could be used for creation of customized stents, thoracic wall prosthesis, etc, avoiding the necessity to harvest bone or cartilage segment from the thoracic wall of the patient with obviously less morbidity. The new frontier of airway surgery is the creation of biological scaffold for pluripotent cells colonization to recreate a "new trachea" for resection that today are not feasible due to the absence of an alternative synthetic or biologic conduit for tracheal replacement [5]. In the coming years, we believe in a widespread use of 3D printer technologies making these technologies affordable for many. Of course, larger studies about 3D printing for surgical planning in tracheal surgery needs to guarantee a correct utilization of this "new technology". Moreover, we should not underestimate the potential that 3D printing has in regenerative medicine and in teaching to trainee. In our opinion becoming familiar with these new technologies is important for the evolution of surgery.

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Received Date: 17 Sep 2019

Accepted Date: 21 Oct 2019

Published Date: 30 Oct 2019

Citation:

Dell'Amore A, Bertelli F, Mammana M, Vida V, Rea F. New Technology Applied to Laryngo-Tracheal Surgery. Clin Surg. 2019; 4: 2630.

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Figure 1: Different materials and printer are available.



Figure 2: Soft materials were used to simulate the resection and reconstruction of trachea.

References

1. Gross BC, Erkal JL, Lockwood SY, Chen C, Spence DM. Evaluation of 3D printing and its potential impact on biotechnology and the chemical sciences. *Anal Chem.* 2014;86(7):3240-53.
2. Tack P, Victor J, Gemmel P, Annemans L. 3D-printing techniques in a medical setting: a systematic literature review. *Biomed Eng Online.* 2016;15:115.
3. Balakrishnan K, Cofer S, Matsumoto JM, Dearani JA, Boesch RP. Three dimensional printed models in multidisciplinary planning of complex tracheal reconstruction. *Laryngoscope.* 2017;127(4):967-70.
4. Hoetzenecker K, Chan HHL, Frommlet F, Schweiger T, Keshavjee S, Waddell TK, et al. 3D Models in the Diagnosis of Subglottic Airway Stenosis. *Ann Thorac Surg.* 2019;107(6):1860-5.
5. Taniguchi D, Matsumoto K, Tsuchiya T, Machino R, Takeoka Y, Elgalad A, et al. Scaffold-free trachea regeneration by tissue engineering with bio-3D printing. *Interact Cardiovasc Thorac Surg.* 2018;26(5):745-52.