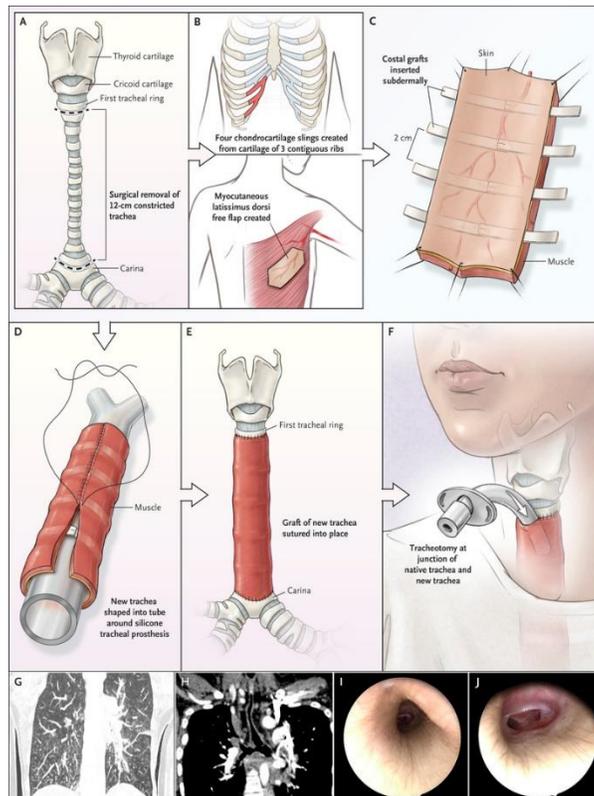


A French multidisciplinary team performed for the first time in the world a complete autologous tracheal reconstruction in a child

Source: "New England Journal of Medicine /NEJM.org.", published on April 05, 2018 and updated on May 17, 2018



A French multidisciplinary team performed for the first time in the world a complete autologous tracheal reconstruction (from its own tissues) in a child.

The team included Dr. Frédéric Kolb, plastic surgeon to Gustave Roussy, the team of Necker-Children's Hospital AP-HP University Descartes - Prs Vincent Couloigner and Erea-Noël Garabedian, ENT and Dr. Régis Gaudin, cardiac surgeon - and Dr. Sacha Mussot, a thoracic surgeon at Marie Lannelongue Hospital.

This procedure conducted four years ago, allows the patient to breathe without tracheotomy and resume a normal life.

Management of tracheal stenosis in a child is complex, and patients with severe tracheal stenosis often require tracheal replacement. There is no ideal method to reproduce the biomechanical properties or mucosal function of the trachea. Here, we report the findings from a 4-year follow-up in a child who had undergone an autologous complete tracheal replacement. Although another child underwent tracheal reconstruction 8 years ago,^{1,2} that child has required repeated insertions of endoluminal stents.

A 12-year-old girl with congenital long-segment tracheal stenosis required urgent complete tracheal replacement after all other available treatments had failed. A long-segment slide trachea-broncho-plasty to repair the trachea at 6 months of age and further multiple endoscopic and open procedures (e.g., insertion of multiple endotracheal stents, a rib-cartilage graft, and a pericardial patch) had failed to restore a stable functional windpipe. Ultimately, granulation of both main bronchi because of a stent led to repeated life-threatening episodes of pneumonia, two cardiac resuscitations, and cachexia (weight of approximately 20 kg at 12 years of age). Since the patient had no option aside from palliative care, three surgical teams (head and neck, cardiothoracic, and plastic surgery) collaborated to attempt autologous complete tracheal replacement according to the techniques used in successful procedures that had been performed in adults.

Autologous Complete Tracheal Replacement in the Patient.

The patient and her parents provided written informed consent. She received extracorporeal membrane oxygenation, and after a sternotomy was performed, a 12-cm tracheal segment was removed, with preservation of the first cartilage ring superiorly and the carina inferiorly (Figure 1A). Simultaneously, a new trachea was manufactured. It consisted of a myocutaneous latissimus dorsi free flap into which four chondrocartilage slings were inserted every 2 cm subdermally (Figure 1B and 1C). The flap was formed into tubular structures around a Y-shaped silicone tracheal prosthesis (Novatech) (Figure 1D). The tracheotomy was performed at the junction between the native trachea and the new trachea (Figure 1E and 1F).

The postoperative course was uneventful, and the silicone stent was removed at postoperative day 9. Daily aspiration of particulate matter from the tracheobronchial tree was necessary for 6 weeks to prevent bronchial plugging and pneumonia due to skin desquamation and lack of endoluminal clearance. The patient was discharged from the intensive care unit on day 55, and she returned home on day 68. The tracheostomy was maintained for more than 2 years for safety reasons and to facilitate checkups. When closure of the tracheostomy was considered, tracheal stenosis at the junction between the flap and native trachea required removal of the first tracheal cartilage ring, including the stenotic portion, and a reanastomosis was performed.

A total of 44 months after the complete tracheal replacement and 13 months after closure of the tracheostomy (Figure 1G through 1J), the patient did not require a stent, immunosuppressive therapy, or a tracheotomy and engaged in the usual activities of a 15-year-old girl. She weighed 36 kg, and her height was approximately 150 cm; both of these values were below the third percentile for her age. Her body-mass index (the weight in kilograms divided by the square of the height in meters) was 16 (the eighth percentile). She required only physiotherapy.

Improvements concerning the lumen lining and the cartilage rings (graft rigidity) still have to be addressed in this technique. Until bioengineered organs^{1,2,4,5} can be manufactured for patients with tracheal stenosis, other pragmatic solutions such as autologous complete tracheal replacement are necessary.