



Open tracheostomy—when do we need it and how we should do it?

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Tracheostomy, a rather common surgical operation, is most often indicated for prolonged mechanical ventilation in intensive care unit (ICU) patients with respiratory failure. There are two main surgical approaches for tracheostomy: open (or conventional or surgical) tracheostomy and percutaneous tracheostomy. The latter was introduced by Ciaglia in 1985 (1) and rapidly accepted worldwide. Today, percutaneous tracheostomy is the method of choice in majority of cases (2), despite that it actually possesses only a few proven advantages over the open method. In addition to the obvious i.e., smaller skin incision and less-tissue trauma, a few meta-analyses have proved percutaneous tracheostomy to be related to lower rate of wound infection and shorter procedure duration (3,4). Percutaneous tracheostomy is performed at bed-side, therefore does not imply patient transfer to and utilization of the operating theatre. Considering intra- and postoperative haemorrhage and postoperative mortality, no difference between the two techniques has been observed (3).

Tracheostomy has several relative contraindications, e.g., coagulation disorders, short neck, obesity, enlarged thyroid gland, neck infection, local malignancy, and history of previous tracheostomy, other cervical surgery or radiotherapy (5). Majority of such patients would be reserved for open tracheostomy. In addition to that, percutaneous tracheostomy is commonly not used in paediatric population. This means that, although the popularity of percutaneous tracheostomy is increasing, the open approach is preferred in patients with one or more relative contraindications to tracheostomy i.e., in more difficult cases. Therefore, standardization of the procedure and proper staff training are particularly important in open tracheostomy. In the recent *Shanghai Chest Journal*, Muscat

and colleagues provided a detailed description of surgical steps in and useful “tips and tricks” for open tracheostomy (6).

Tracheostomy can also have potentially life-threatening complications. Major haemorrhage after injuring large blood vessels, oesophageal injury, pneumothorax, pneumomediastinum, loss of airway and other serious complications have been described in the literature. Although these devastating examples have been rare, minor intra- or postoperative complications have been reported in up to 31% of tracheostomy patients. Many of these complications could have been prevented and have been related to equipment unavailability, lack of staff training and sub-optimal communication within the team (7). In their paper, Muscat *et al.* also stress the paramount importance of patient preparation (including positioning) prior to the operation, plus the importance of a large selection of tracheostomy tubes available at each operation (6). The exact steps in performing tracheostomy may slightly vary between hospitals, however it is advisable to standardize the operation within one institution, based on local expertise. That would give confidence to all team members and prevent misunderstandings between surgeons and anaesthesiologists.

Speaking about tracheostomy complications, one should also keep in mind the importance of the final step in the operation—securing the tracheostomy cannula to skin with stiches or Velcro tape. Cannula displacement in early postoperative period (e.g., during patient transfer from operating table to bed) can lead to acute respiratory failure, especially in cases requiring high ventilatory support or in paediatric patients. As a displaced cannula cannot usually be re-inserted, the patient would need urgent orotracheal re-intubation, and repeat tracheostomy.

With emergence of percutaneous tracheostomy, different specialists – anaesthesiologists, otolaryngologists, general surgeons, cardiothoracic surgeons and others perform tracheostomy. According to a recent guideline, percutaneous tracheostomy can be performed by any specialist with adequate training (5). However, when there are too many specialists in one hospital performing tracheostomy, their experience would be limited and thus the risk of developing procedure related complications would increase. A study by Mirski *et al.* demonstrated that a dedicated team performing the operation decreases the rate of complications and duration of the procedure (8). Good evidence about the learning curve in tracheostomy is not available. Current treatment recommendations are limited to expert opinions. While otolaryngology training program directors in United States have estimated that 9.4 tracheostomies should be performed to reach competence (9), the American Colleague of Chest Physicians recommends at least 20 percutaneous tracheostomies (10). European Respiratory Society and American Thoracic Society guidelines recommend 5–10 operations under supervision before independent practice, and to maintain competence, at least 10 procedures yearly (11).

Finally, the tracheostomy operation is not always either open or percutaneous, but could be something intermediate, depending on the situation and local expertise. Molardi *et al.* suggest a Parma tracheostomy technique (12). In contrast to the open technique, they make a shorter skin incision, avoid using electrocautery, but perform a blunt dissection to fully visualize trachea. The tracheostomy tube is inserted, using Seldinger technique over a silicon probe (12). Limited surgical dissection, to either clearly palpate or visualize the anterior tracheal wall, allows proper insertion of the guide wire needle and eliminates the need for bronchoscopy or ultrasound to guide the procedure (13). Especially in morbidly obese patients, such a “half-open” tracheostomy might make the operation easier and safer.

In conclusion, although tracheostomy is a common surgical procedure, in complex situations it may have intra- or postoperative complications. The complications can be avoided when all the patient, surgical team and also equipment are adequately prepared for the operation. The surgical technique should be standardized and all team members fully trained for the operation. Although nowadays the percutaneous approach can and should be preferred in majority of tracheostomy cases, open tracheostomy still plays an important role, especially in complex situations. Evolution of tracheostomy techniques

continues. To achieve utmost safety and best identify the anatomical landmarks in the tracheostomy operation, open and percutaneous methods could be combined and bronchoscopy or ultrasound support considered.

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