

Is Percutaneous Dilational Tracheotomy Equivalent to Traditional Open Surgical Tracheotomy With Regard to Perioperative and Postoperative Complications?

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BACKGROUND

Tracheotomy is one of the most common procedures performed by otolaryngologists. The traditional method involves an open surgical technique (OST) performed in the operating room (OR). Since the mid-1980s, percutaneous dilational tracheotomies (PDT) have been performed by otolaryngologists and nonotolaryngologists with increasing frequency. An energized discussion in the literature has raised questions about the superiority of one technique versus the other in regard to the perioperative and long-term postoperative complications. Several prospective studies and meta-analysis reviews have addressed this question and compared OST with PDT. This review will summarize some of this literature to address the question of which technique is superior with respect to associated complications. It should be noted that the important discussion of medical economics related to tracheotomy is beyond the scope of this brief review.

LITERATURE REVIEW

A meta-analysis by Higgins and Punthakee¹ selected 15 prospective, randomized, controlled trials that included nearly 1,000 patients to compare OST and PDT. Inclusion criteria consisted of English language publications that examined elective PDT versus OST and were random or quasirandom clinical trials with outcome measures that included complication rates. They reviewed 368 abstracts, and from that initial search included 15 articles that were considered eligible

for inclusion. From the 15 articles, there were 490 patients who underwent PDT and 483 OST. The authors found a decreased incidence of unfavorable scarring ($P = .01$), wound infection/stomatitis ($P = .0002$), and decreased case length ($P < .00001$) favoring PDT. For complications relating to decannulation and airway obstruction, OST was favored ($P = .009$). There was no statistical difference between groups for false passage rates, minor or major hemorrhage, or death. When patients were transferred to the OR for OST, PDT was better than OST in terms of overall complications ($P = .01$). This difference was nullified when the operator for both groups was a surgeon or when OST and PDT were both performed in the intensive care unit. Long-term complications and rates of subglottic stenosis were not different between groups; however, of the 15 articles reviewed for this article, only 10/15 had postoperative follow-up ranging from 6 days to 4 years, with 6/10 having <3 months follow-up time.

Similarly, Oliver et al.² performed a meta-analysis of prospective studies comparing PDT and OST on the basis of mortality, complications, and procedure time. Included were 14 studies encompassing 1,273 patients. Eight studies were randomized and six nonrandomized. There was no significant difference between groups with respect to mortality, early complication, or late complication rates. Subgroup analysis of four studies that randomized patients into either PDT or bedside open surgical tracheotomy (BOST) revealed a significantly lower complication rate of BOST versus PDT ($P = .001$). Finally, PDT was significantly faster to perform than OST ($P = .01$). However, the clinical significance of shorter operative times (<10 minutes' difference in each of the two studies) is not clear.

Halum and colleagues³ published a multi-institution retrospective study that attempted to characterize the nature of airway injury and complications in 1,175 tracheotomy patients in a highly granular manner. In an unexpected finding, the rate of perioperative wound bleeding was found to be higher in PDT compared to OST. This risk was negated, however, when stay sutures were used to secure the tracheotomy tube flange to the skin.

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Few published articles feature adequate follow-up or objective measurements to detect both symptomatic and nonsymptomatic stenosis. Koitschev et al.⁴ examined 146 patients transferred to a rehabilitation center with tracheotomies. Of those patients, 71.9% had undergone PDT and 28.1% OST. Each patient underwent either rigid or flexible endoscopy at the time of decannulation and was determined to have either no airway stenosis, stenosis involving <50% of the diameter of the airway (grade I), or stenosis of >50% of the airway (grade II). PDT patients were found to have grade I stenosis in 58.1% of cases and grade II stenosis in 23.8% of cases, as opposed to OST patients, who had a rate of grade I in 24.4% and grade II in 7.3% of cases. These rates were significantly different for both grade I ($P = .0004$) and grade II stenosis ($P = .033$) favoring OST. All stenosis was noted to be suprastomal. These numbers, although high, are not outside of the realm of other studies that have examined long-term complication rates from PDT. Norwood et al.⁵ followed 420 patients who underwent PDT over a 7-year period and were evaluated for subglottic stenosis with high-resolution computed tomography (CT) and fiberoptic laryngotracheoscopy. Forty-eight patients agreed to participate in the study. CT revealed <10% stenosis in 17%, >10% stenosis in 31%, and no evidence of stenosis in 52%. Mild stenosis (11%–25%), although asymptomatic, occurred in 21%. Moderate stenosis (26%–50%) occurred in 8.3%, half of whom were asymptomatic. Finally, severe stenosis (>50%) occurred in one patient (2%), whose course was complicated by tracheoesophageal fistula. This high

degree of stenosis, albeit mostly asymptomatic, can possibly be explained by the nature of tracheotomy tube insertion via PDT, which may cause comminuted multi-level cartilage fractures.

BEST PRACTICE

PDT appears to be a safe alternative to traditional open surgical tracheotomy. There is no body of literature favoring one over the other in terms of perioperative complication rates. With respect to airway stenosis, there may be a higher incidence of asymptomatic tracheal stenosis with PDT, the clinical significance of which is not clear.

LEVEL OF EVIDENCE

Higgins and Punthakee¹ and Oliver et al.² were level I evidence-based medicine (EBM). Halum,³ Koitschev et al.,⁴ and Norwood et al.⁵ were all level II EBM.

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