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Percutaneous Dilatational Tracheostomy; Diagnosis and Mortality Rate in Intensive Care Saiful Anwar Hospital

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A B S T R A C T

Introduction: Tracheostomy is a common surgical procedure performed on critically ill intensive care patients. Reports have documented considerable associated morbidity, with complication rates varying from 6 to 66%. The reports on mortality associated with tracheostomy range from 0 to 5%. Since its introduction, percutaneous dilatational tracheostomies (PDT) have gained increasing popularity. The most commonly cited advantages are the ease of the familiar technique and the ability to perform the procedure at the bedside.7 This paper aims to study the mortality rate and diagnosis of patients who performed the percutaneous dilatational tracheostomy procedure in the ICU of Saiful Anwar Malang Hospital. **Methods:** Observational analytical research is carried out cross-sectionally. Data was collected from the medical records of patients undergoing PDT for the period July 2022 – October 2022. Statistical analysis using the Chi-square test. **Results:** From 39 subjects, 34 (87.2%) subjects experienced respiratory failure. The most common cause was HAP pneumonia (61.5%), followed by CVA (17.9%) and CAP pneumonia (12.8%); the rest were EDH, SAH, and ASD secundum, as much as 2.6%. The outcome was that 13 (33.3%) subjects died, and the rest survived and were transported to a care ward. Correlation between patient outcomes with respiratory failure p=0.735, with diagnosis p=0.309. **Conclusion:** The most common diagnosis of PDT is HAP pneumonia. There was no significant correlation between diagnosis and mortality of patients performed by PDT.

1. Introduction

Introduced by Ciaglia in 1985, percutaneous dilatational tracheostomy (PDT) is commonly practiced today, adopted by practitioners of multiple disciplines, including otolaryngologists, anaesthesiologists, intensivists, trauma surgeons, and chest surgeons.[1-4] Numerous studies have compared the outcome of PDTs with open tracheostomies, finding no clear superiority of one technique over the other.[5-8] Nevertheless, some data suggests that PDT may offer lower rates of immediate complications.[9,10] Furthermore, PDT is generally more available than an open tracheostomy. Additionally, when performed at the bedside, it spares the need to transfer high-risk patients, making it the procedure of choice for high-risk, chronically ventilated patients in intensive care units (ICUs).[11,12] PDT in ICU is classically indicated to facilitate weaning in difficult-to-wean patients, to aid in tracheobronchial toileting, to protect airways in patients at risk of aspiration, in anticipated prolonged ventilator stay, and to minimize sedation requirement.

The diagnosis of indications for percutaneous dilatational tracheostomy varies, one of which is in a study conducted by Koc et al. in 2022 which observed

492 tracheostomy patients, suggesting that the most common indications for tracheostomy were chronic obstructive pulmonary disease in 70 (18%), cerebrovascular disease in 63 (16.2%), cardiac arrest in 43 (11%), and malignant disease in 32 (9%) patients.[13] The mortality rate that occurs can vary depending on the diagnosis and whether or not the PDT procedure is performed. Staibano et al in 2021 concluded in his research that early tracheostomy in patients with COVID-19 may reduce ICU stay.[14] The diagnosis of indications and incidence of mortality in patients carried out percutaneous dilatational tracheostomy at Saiful Anwar Hospital Malang is not yet clearly known. This paper aims to study the mortality rate and diagnosis of patients who performed the percutaneous dilatational tracheostomy procedure in the ICU of Saiful Anwar Malang Hospital.

2. Methods

This research is a non-experimental analytical observational study with a cross-sectional method. This research was conducted from July 2022 to October 2022. The population in this study was patients who underwent percutaneous dilatational tracheostomy in the ICU of Saiful Anwar Malang Hospital. The subjects used were patients who underwent percutaneous dilatational tracheostomy using non-probability sampling, namely consecutive sampling. The total sample was 39 patients who had met the inclusion criteria. The inclusion criteria are patients undergoing percutaneous dilatational tracheostomy in the ICU of Dr. Saiful Anwar Malang Hospital for the period of July – October 2022 whether they died or not and the exclusion criteria is patients who were carried out by PDT not in that period. The data obtained is secondary data through the medical records of patients undergoing PDT to obtain data on patient diagnoses and outcomes. The variables of diagnosis and patient outcomes are nominal variables. The data from the statistical analysis were obtained using SPSS software with descriptive test methods and chi-square correlation tests for both variables. Meaningfulness is determined based on the p-value < 0.05.

3. Results

Of the 39 subjects, 13 (33.3%) of the subjects died, and 26 (66.7%) of the subjects survived. The most indicative diagnosis of PDT was respiratory failure patients (87.2%) due to HAP pneumonia (61.5%) (Table 1).

Table 1. Profile of the subjects of the study.

Variables	n	Percentage
Respiratory failure		
Yes	34	87.2%
No	5	12.8%
Diagnosis		
HAP pneumonia	24	61.5%
CAP pneumonia	5	12.8%
CVA	7	17.9%
EDH	1	2.6%
SAH	1	2.6%
ASD secundum	1	2.6%
Outcome		
Survived	26	66.7%
Died	13	33.3%

Table 2. Chi-square correlation test results.

Variables	Outcome		P value
	Survived (n,%)	Died (n,5)	
Respiratory failure			
Yes	23 (88.5%)	11 (84.6%)	0.735
No	3 (11.5%)	2 (15.4%)	
Diagnosis			
HAP pneumonia	15 (57.7%)	9 (69.2%)	
CAP pneumonia	5 (19.2%)	0 (0.0%)	
CVA	4 (15.4%)	3 (23.1%)	0.309
EDH	1 (3.8%)	0 (0.0%)	
SAH	1 (3.8%)	0 (0.0%)	
ASD secundum	0 (0.0%)	1 (7.7%)	

In both patient outcome conditions, it was no different because the average patient in both experienced respiratory failure and the most was due to HAP pneumonia, which was 57.7% in survived patients and 69.2% occurred in patients who died. The data obtained were analysed using the Chi-square correlation test method to determine its significance and found no significant correlation between the outcomes of patients with respiratory failure conditions and the underlying diagnosis ($p>0.05$) (Table 2).

4. Discussion

This paper aims to study the mortality rate and diagnosis of patients who performed the percutaneous dilatational tracheostomy procedure in the ICU of Saiful Anwar Malang Hospital. It was found that almost all subjects, as many as 87.2% of patients experienced respiratory failure and percutaneous dilatational tracheostomy was performed. The literature posits that in patients in the medical ICU, the common indication for tracheostomy is respiratory failure and the need for continued mechanical ventilation.[15,16] About 5–10% of the ICU population require prolonged mechanical ventilation.[17] Upper airway obstruction is another indication for tracheostomy as in trauma, angioedema, malignancy and obstructive sleep apnoea. Often tracheostomy may need to be done emergently to secure the airway. A tracheostomy is often done to assist with clearance of profuse secretions. Tracheostomy can be done either surgically or percutaneously. Compared to surgical technique, the percutaneous dilatational tracheostomy (PDT) uses a modified Seldinger technique where the trachea is accessed with a needle and then a guidewire is inserted.[18,19] The tracheostomy tube is introduced over the guidewire after dilation. Infection on neck wall and unstable patient are contraindications for tracheostomy. Historically, relative contraindications for the procedure were obesity, bleeding diatheses, limited neck mobility (e.g., trauma patients or when neck cannot be extended), distorted anatomy or prior neck surgery (including prior tracheostomy), and high ventilator support.

In this study, it was found that the most diagnosis was hospital acquired pneumonia. It can be said that during hospital treatment, many patients are exposed to hospital acquired pneumonia and cause respiratory failure so that percutaneous dilatational tracheostomy is needed. The results of this study are different from study conducted by Koc et al, in 2022 which observed 492 tracheostomy patients, suggesting that the most common indications for tracheostomy were chronic obstructive pulmonary disease in 70 (18%), cerebrovascular disease in 63 (16.2%), cardiac arrest in 43 (11%), and malignant disease in 32 (9%) patients.[13] The second most common diagnosis is cerebrovascular accident which consists of CVA ICH subcortex, CVA brain stem, CVA temporal lobe infarction. The literature says that patients with severe ischemic and haemorrhagic stroke may require tracheostomy in the course of their disease. This may apply to stroke unit patients whose deficits include a

severe dysphagia posing such risk of aspiration as it cannot be sufficiently counteracted by tube feeding and swallowing therapy alone. More often, however, tracheostomy is performed in stroke patients so severely afflicted that they require intensive care unit treatment and mechanical ventilation. In these, long-term ventilation and prolonged insufficient airway protection are the main indications for tracheostomy. Accepted advantages are less pharyngeal and laryngeal lesions than with prolonged orotracheal intubation, better oral hygiene and nursing care, and higher patient comfort.[20] Stroke can result in varying degrees of respiratory failure. Some patients require tracheostomy in order to facilitate weaning from mechanical ventilation, long-term airway protection, or a combination of the two. In 1,550,000 patients discharged with ischemic stroke nationwide, the rate of tracheostomy was 1.3% (95% CI, 1.2–1.4%), with a 1.3% (95% CI, 1.1–1.4%) rate in patients without decompressive craniectomy and a 33% (95% CI, 26–39%) rate in the surgical-treatment group. Logistic regression analysis identified pneumonia as being significantly associated with tracheostomy after decompressive craniectomy (OR 3.95; 95% CI 1.95–6.91).[21] It is not known whether pneumonia plays a causative role in the need for tracheostomy, but it is a potentially modifiable risk factor. These results support the importance of preventative measures for ventilator-associated pneumonia, including topical antibiotics, probiotics, and patient positioning, among others.[22-25] In addition, several small randomized trials have suggested that prophylactic antibiotics may prevent infections in stroke patients, who are at high risk of infection due to many factors, including post-stroke immunodepression.[26] Given the high rate of pneumonia in patients with stroke and decompressive craniectomy and the association between pneumonia and the need for tracheostomy, the subpopulation of patients with severe stroke necessitating craniectomy may be a suitable group for further trials of prophylactic antibiotics.[21]

A total of 13 subjects, 33.3% of patients, died in this study, but the data we have cannot determine the exact cause of death of these patients. Some literature says, however, that tracheostomy can reduce mortality rates in patients with respiratory failure. Staibano et al in 2021 concluded in his research that there's decreased risk of mortality in patients with COVID-19 who underwent tracheostomy (96 of 342 [38.1%]) compared with those who did not undergo tracheostomy (140 of 238 [58.8%]; OR, 0.26; 95% CI, 0.09-0.77; n = 580 patients; 5 studies [7.2%].[14] Simon et al identified total of 71 cases of lethal outcome following PDT, the incidence of lethal complications was calculated to be 0.17%. Of the fatal complications, 31.0% occurred during the procedure and 49.3% within seven days of the procedure. The main causes of death were: haemorrhage (38.0%), airway complications (29.6%), tracheal perforation (15.5%), and pneumothorax (5.6%), according to this analysis, PDT-related death occurs in 1 out of 600 patients receiving a PDT.[27] Statistical analysis using chi-square has been performed, and no significant results have been obtained between mortality and patient diagnosis of percutaneous dilatational tracheostomy. It can be said that the death of patients carried out by PDT can be influenced by many other different factors in each patient, such as age, comorbidities, risk factors, disease severity, and other complications.

5. Conclusion

Respiratory failure due to hospital-acquired pneumonia is one of the most common indications of percutaneous dilatational tracheostomy. Risks and complications should be prevented to reduce the number of hospital-acquired pneumonia cases. Mortality rates did not have a significant correlation with patient diagnoses of percutaneous dilatational tracheostomy.

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