Emergency Percutaneous Tracheostomies By A Non-Surgical Intensivist
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Citation

Abstract

INTRODUCTION

Tracheostomy is a common procedure performed in the critically ill patients. Until recently this has been done surgically. In 1985, Ciaglia and coworkers described the technique of percutaneous tracheostomy (PCT) which has been used extensively at the bedside in many critical care units [1]. Grigg in 1990 introduced modifications of the original method described by Ciaglia [2]. It was primarily intended as an elective bedside procedure in ventilator dependent patients. One of the major contraindications for a long time had been in emergency situations. This is gradually becoming a diminishing contraindication with recent reports of a few successful cases among experienced surgeons. We however report four cases of emergently performed PCT by non-surgeons.

CASE 1

A twenty seven year old African American male with no significant past medical history presented to the emergency room with complaints of nausea, vomiting and generalized weakness which was more prominent in lower extremities for 3 days. Patient admitted increased thirst and urination at home over the last month. He denied any weight loss, abdominal pain, fever, headache, history of allergies to medications, smoking, and the use of alcohol or illicit drugs. Examination revealed a lethargic young man with a Glasgow coma score was of 14, temperature was of 98.7°F, blood pressure was of 140/70 mm Hg, heart rate of 120 beats/min, and respiratory rate of 20 breaths/min with saturation of 98% on room air. Patient had difficulty moving extremities especially lower extremities, with intact sensation bilaterally; muscle strength on upper extremities was 3/5 bilaterally, on lower extremities 2/5 bilaterally. The deep tendon reflexes were diminished bilaterally. Babinski sign was negative and neck was supple. Lungs were clear to auscultation bilaterally, heart rate was regular, and no murmurs were appreciated. Laboratory investigations were significant for sodium of 158 meq/L, potassium 3.2 meq/L, magnesium 1.6 mg/dL, inorganic phosphate 0.5 mg/dL, bicarbonate (HCO3) 17 meq/L and serum glucose 1086 mg/dL. Urine drug screen, chest roentgenogram, and computerized tomogram (CT) of the head were unremarkable. He was admitted to the intensive care unit (ICU) for management of diabetic ketoacidosis. On the second day of admission, patient developed sudden shortness of breath with stridor, cyanosis and became unresponsive. Attempts at emergency orotracheal intubation failed. He was also bradycardic and hypotensive requiring epinephrine administration. An emergency percutaneous tracheostomy using the revised Ciaglia technique with an Ultraperc (portexâ percutaneous dilation tracheostomy Kit, Smith Medical International Ltd. Hythe, Kent UK) without bronchoscopic guidance was done. The tracheostomy tube was inserted in less than 2 minutes. Patient was ventilated adequately and awakened in about 30 minutes. He was weaned off the ventilator on day 5 and decannulated on day 7 and eventually discharged home without any complications.

CASE 2

A thirty-five year old male was admitted through the trauma service. He had fallen in the course of battling of a house fire and sustained multiple long bone fracture and an unstable cervical fracture, as well as, a severe smoke inhalation. He required mechanical ventilation. A hallo was placed by neurosurgeons for management of the cervical spine injury. While the patient was being transported from the CT suite to
the surgical/trauma intensive care unit his orotracheal tube was dislodged. Multiple attempts for re-intubation failed. The patient was desaturating and emergency percutaneous tracheostomy was performed (Per-fit™ percutaneous tracheostomy kit, Portex, inc Keene NH). Duration of procedure was 95 seconds. He was subsequently weaned from mechanic ventilation and decannulated without complications.

**CASE 3**

A fifty-eight year old female with no significant past medical history was admitted for a two month history of weakness and exertional dypsnea. Physical examination was significant for distended jugular veins and distant heart sounds. An echocardiogram revealed a large pericardial effusion with impending tamponade. An arterial blood gas analysis revealed pH of 7.22, pCO2 105, paO2 63mmHg, HCO3 44 meq/L and oxygen saturation of 86% on room air. Patient had an emergency pericardial window for relief of pericardial effusion. Attempts at managing hypoventilation with none invasive positive pressure ventilation failed and patient was intubated. On hospital day five after a spontaneous breathing trial she was liberated from the mechanical ventilator. Three hours later, she developed shortness of breath and worsening desaturation. Multiple attempts at orotracheal intubation, including retrograde intubation were futile. The patient developed cardiopulmonary instability. Resuscitation was instituted. Bradycardia and hypotension responded to atropine and epinephrine, respectively. An emergent percutaneous dilational tracheostomy with the Portex Ultraperc was performed successfully with insertion of 8 mm tracheostomy tube in less than 2 minutes. Her course on mechanical ventilation was complicated by nosocomial pneumonia and pleural effusions. She was successfully extubated and discharged from the hospital on post tracheostomy day 12 and 17 respectively, without complications.

**CASE 4**

A twenty-three year old Hispanic female with past medical history of type 1 diabetes mellitus, veno-thromboembolism and drug dependency was admitted in the ICU for management of ketoacidosis and acute respiratory failure. Patient’s hospital course was complicated by acute respiratory distress syndrome and septic shock. After one week of mechanical ventilation, patient was successfully liberated from mechanical ventilator and extubated. Reintubation, however, became necessary shortly afterwards for stridor and upper airway obstruction. A subsequent attempt after 72 hours at extubation failed for the same reason. This time, however, orotracheal intubation was unsuccessful. Patient developed bradycardia and asystole. During the process of cardiopulmonary resuscitation an emergent dilational percutaneous tracheostomy was performed with a Portex Ultraper with adequate airway secured in two minutes.

**DISCUSSION**

The ability to secure an airway emergently in most cases can make a difference between life and death. Orotracheal intubation is the predominate method of choice. Unfortunately, there are occasions when this is not possible or contraindicated. Under such circumstances an open tracheostomy or a cricothyroidotomy has been the procedure of choice. Percutaneous tracheostomy (PCT) in experienced hands is gradually being added to a limited number of lifesaving emergency procedures. Currently, percutaneous tracheostomy is considered an elective procedure, with surgical tracheostomy considered the procedure of choice for patients in whom orotracheal or nasotracheal airway fails. However, reports of percutaneous tracheostomy in the emergency setting have begun to emerge, with encouraging results. A handful of emergency percutaneous tracheostomy procedures have been documented [3]. Ben-nun, et.al., have reported PCT in trauma patients and believe it to be an easier and safer alternative to surgical tracheostomy. The procedure was performed in 10 patients using the Grigg’s method by surgeons who had experience with more than eighty cases of both surgical and percutaneous tracheostomy. Their patients included patients with cervical spine fractures, maxillofacial trauma, head and neck burns and inhalation injuries [4]. In another two case series of PCT among 6 and 4 patients respectively requiring emergency intubation, successful timely PTC was achieved with no complications [5, 6]. In the experienced hand, emergency PCT can be performed more quickly than surgical tracheostomy [5]. A case of an unstable patient with cardiogenic shock and respiratory failure requiring a simultaneous emergency PCT and intraaortic balloon pump have been reported [7]. Considering the shorter duration to achieve patent airway and the safety profile, some centers have adopted PCT as the procedure of choice in patients requiring emergency tracheostomy using the Grigg’s method [6]. Successful emergency PCT has also been reported in patients with failed intubation due to upper air way obstruction from hematoma [8, 9], angio-edema secondary to aspirin ingestion [10], severe burn [11], and bronchial cancer [12]. The time required to perform PCT in emergency situations depends on
the experience and expertise of the surgeon/intensivist. The average time in our case is two minutes. One study compared the speed of placement of the Grigg’s method and the Ciaglia sequential dilator technique. The Griggs method was significantly faster (mean 89 s, range 69–105 s) when compared with the Ciaglia technique (mean 217 s, range 180–267 s) [13].

We report 4 cases performed by a non-surgical intensivist with experience in performing over 500 non bronchosopic guided PCT in trauma and nontrauma patients including those with relative contraindications – cervical spine fractures, obesity, short, fat neck, inability to extend the neck, prior neck surgery, and coagulopathy. We as other authors believe that in experienced hands emergency percutaneous tracheostomy is easy, safe and can be performed quicker than a surgical tracheostomy without complications.

References
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