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Percutaneous tracheostomy in patients with cervical spine fractures – feasible and safe

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Abstract

The aim of this study is to evaluate the short and long-term results of percutaneous tracheostomy in patients with documented cervical spine fracture. Between June 2000 and September 2005, 38 consecutive percutaneous tracheostomy procedures were performed on multi-trauma patients with cervical spine fracture. Modified Griggs technique was employed at the bedside in the general intensive care department. Staff thoracic surgeons and anesthesiologists performed all procedures. Demographics, anatomical conditions, presence of co-morbidities and complication rates were recorded. The average operative time was 10 min (6–15). Two patients had minor complications. One patients had minor bleeding (50 cc) and one had mild cellulitis. Nine patients had severe paraparesis or paraplegia prior to the PCT procedure and 29 were without neurological damage. There was no PCT related neurological deterioration. Twenty-eight patients were discharged from the hospital, 21 were deannulated. The average follow-up period was 18 months (1–48). There was no delayed, procedure related, complication. These results demonstrate that percutaneous tracheostomy is feasible and safe in patients with cervical spine fracture with minimal short and long-term morbidity. We believe that percutaneous tracheostomy is the procedure of choice for patients with cervical spine fracture who need prolonged ventilatory support.

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Keywords: Tracheostomy percutaneous; Fracture cervical spine

1. Introduction

In the last decade, percutaneous tracheostomy (PCT) has become a routine practice in many hospitals. In the early publications, most authors considered adverse conditions such as short-fat neck, enlarged thyroid, inability to extend the neck, previous neck surgery, presence of a coagulopathy and suspected or documented cervical spine fracture as relative or absolute contraindications for PCT [1–8]. More recently, several reports demonstrated the feasibility and safety of PCT in patients with some of the above contraindications [9–15]. In a computerized search of the literature, the authors could not find articles addressing the safety and long-term results of PCT in trauma patients with documented cervical spine fracture (CSF). Reported herein is our experience with thirty-eight consecutive PCT procedures performed on multi-trauma patients with CSF.

2. Materials and methods

Between June 2000 and September 2005, 38 consecutive percutaneous tracheostomy procedures were performed on multi-trauma patients with documented cervical spine fracture. The indications for tracheostomy were prolonged mechanical ventilation, failure of extubation and need for intermittent respiratory support. A small group of qualified thoracic surgeons who had large experience with PCTs (more than 80 previous cases) performed the operations in the general intensive care department of a major tertiary care facility. The Helsinki Committee approved the procedure. Conscious patients signed the informed consent and in unconscious patients, the appointed legal guardian signed the informed consent. All PCTs were performed as a bedside operation using a modification of the Griggs' technique and a Portex set of instruments (SIMS Portex, Hythe-Kent, England) as was described previously [10,11]. The appropriate intensive care monitoring was used in all cases. The procedure was performed as described in the manual accompanying the Portex PCT kit, with some modifications.

All patients were supine without neck extension. The available anatomical landmarks (thyroid cartilage, cricoid cartilage, tracheal cartilages and sternal notch) were identified. In ten patients, it was possible to palpate all of these landmarks. However, in twenty-eight patients only the sternal notch and the thyroid cartilage were clearly identifiable. A gentle rostral traction on the larynx was applied to gain better exposure of the surgical field. The neck was prepared and draped according to the cervical fixation apparatus (Philadelphia support device, Hallow apparatus, Internal fixation or Cranial traction). Local anesthesia was used in all patients (10 ml of 1% lidocaine solution). Horizontal skin incision was followed by a blunt dissection of the subcutaneous and pretracheal tissues,

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using a Pean clamp, to form a tract wide enough to accommodate the tip of the surgeon’s finger. The anterior tracheal wall was palpated and the oro-tracheal tube was cautiously withdrawn with the surgeon’s finger control. Thereafter, puncture of the tracheal wall was performed with the needle-cannula in the space between the first and second tracheal cartilages and the rest of the procedure was completed using the guide-wire and the dilating forceps as described in the manual accompanying the Portex PCT kit. The balloon on the tracheostomy cannula was over inflated (15 cc) for approximately 30 min as a preventative tamponade on the luminal surface of the trachea. If the skin incision was greater than the diameter of the tracheostomy cannula, simple cutaneous sutures were placed on either side of the cannula and the tissues approximated until the stoma fitted snugly around the cannula. The thoracic staff surgeons did the in-hospital follow up until decannulation was accomplished. Long-term follow up was performed in the outpatients clinic and by telephone questionnaire.

3. Results

Twenty-nine male and nine female patients with cervical spine fractures were included in this study. The average age was 47 years (range: 19 to 76) and the mean operation time was 10 min (6–15). Sixty percent of the patients had more than one fracture in the cervical spine. The most common sites were C2 and C6 (nine patients). Two patients had minor complications. One patient had minor bleeding (50 cc) and one had mild cellulitis around the stoma.

Nine patients had severe paraparesis or paraplegia prior to the PCT procedure and 29 were without neurological damage. There was no PCT related neurological deterioration. The percutaneous operation was completed in all patients without conversion to the open technique. During the early (in-hospital) follow up, ten patients died of causes unrelated to the PCT. Twenty-eight patients were discharged from the hospital, 21 underwent uneventful decannulation. The average follow-up period was 18 months (1–48). There was no late, procedure related, morbidity or mortality. Twenty-four patients were available for long-term clinical evaluation in the outpatients clinic and four were lost to follow-up. Seventeen of these patients were followed for more than a year after the PCT. Fifteen patients underwent CT scan of the neck and/or the chest, which included the location of previous PCT, as part of their orthopedic, thoracic or maxillofacial follow-up. No tracheostomy-related complication was diagnosed although reduction of the tracheal diameter by less than 10% diameter was found in five patients, all were without any associated symptoms. Five of these patients also required fiber-optic bronchoscopy due to minor hemoptysis (2 patients), dyspnea (2 patients) and hoarseness (1 patient). In all cases there was no pathological finding at the PCT site.

4. Discussion

In recent years, percutaneous tracheostomy has become a common practice in many hospitals throughout the world. Numerous studies assessed the safety of the procedure, length of operation and incidence of short- and long-term complications [1–8]. A number of clinical and anatomical conditions such as morbid obesity, short fat neck, enlarged thyroid, emergency loss of airway and cervical trauma, were considered as relative or absolute contraindications [1–5]. Recently, more than a few articles reported the safety and feasibility of PCT in these situations [11,13,14]. Ben Nun et al. reported their positive experience with PCT in emergency cases [11] and Mayberry and coauthors demonstrated the safety of the procedure in trauma patients without cervical-spine clearance [9].

Fracture in the cervical spine makes tracheostomy procedure more complex and demanding than the usual, no matter which technique is employed, open or percutaneous. The inability to extend the neck, the presence of recent surgical scar (internal fixation), an external fixation device (hollow or Philadelphia) in the surgical field, makes the operation more complex and challenging. In the early phase of our learning curve, the complexity of the situation justified the classification of CSF as a contraindication for PCT. However, with the accumulation of experience the advantages of PCT became more apparent and our indications for PCT expanded gradually. We found that, no matter which device was used to treat the cervical spine fracture, a gentle rostral traction improved exposure of PCT site and made the procedure feasible and safe. Like us, O’Keeffe et al. [14] and others [15] had encouraging results with PCT in patients with CSF. They published their positive experience with PCT following anterior approach and internal fixation of the fracture. These studies, however, focused mainly on the feasibility of the procedure and the short-term outcome. In a computerized study of the literature, we could not find articles referring to the feasibility, safety and long-term results of PCT in patients with external or internal fixation of CSF. Reported herein are the encouraging results of a long-term follow-up in this unique subgroup of patients. In this series all PCT procedures were performed at the patient’s bedside in the intensive care unit. There was no case of conversion to open surgery. We did not have PCT related neurological deterioration and only two cases of mild, early surgical complications were diagnosed. The long-term follow-up in this study is not perfect. Twenty-six percent of the patients died in the hospital and 14% of the survivors were lost to follow-up. The long-term follow-up included clinical data in all patients but only 63% underwent imaging of the PCT site using bronchoscopy and/or CT scan. Nevertheless, we did not find any significant PCT related complication.

On the basis of these data, we conclude that PCT is feasible and safe in patients with CSF. Actually, in this clinical setting we believe that PCT is even easier when compared with open tracheostomy. Thus, we recommend that cervical spine fracture would not be considered a contraindication for PCT anymore. We do think, however, that experienced surgeons familiar with the technique and way beyond their learning curve should perform these procedures.
References


