Original Article

Percutaneous Dilatational tracheostomy: an Observational Study at Birat Medical College and Teaching Hospital, Kathmandu, Nepal

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Article info
Received : 21.03.2023
Accepted : 30.04.0023
No. of Tables : 0
No. of Figure : 0
No. of References : 16

Cite the Article:
Shah RK, Ullah MS, Koirala B, Rajbansi LK, Hasan DM, Arjyal B. Percutaneous Dilatational tracheostomy: An observational Study at Birat Medical College and Teaching Hospital. Pabna Med. Cal. J. 2023;2(1): page 3-6.

Keywords: Bleeding, percutaneous dilatation tracheostomy, premature extubation, prolonged intubation

Abstract:

Background: *Tracheostomy is the most commonly performed procedure worldwide. It is mainly done in the critically ill patients requiring long term ventilation, facial trauma, laryngeal fractures, laryngeal malignancy, etc. Converting from endotracheal intubation to tracheostomy has many benefits in terms of maintaining the laryngeal function, feeding, safety and it is more comfortable than endotracheal intubation. Tracheostomized patients requires less analgesics and sedatives. It also helps in easier and early weaning from mechanical ventilator, possibility of speech, initiation of oral intake of medication. This all contributes to shorter ICU stay and hospital stay which becomes more cost effective.*

Methods: *This is a prospective observational study that was conducted in the 22 bedded neuro intensive care and medical intensive care unit of Birat Medical College and Teaching Hospital. The data were collected from 1st Aug 2021 to 28th Feb 2022. All the patients needing tracheostomy for prolonged intubation, protection of airway and to maintain tracheobronchial toileting was taking under study.*

Results: *Our study was a prospective observational regarding percutaneous dilatational tracheostomy. A total of 71 patients were included in the study. Out of which 39(54.9%) were male and 32(45.1%) were female with the ratio of (1.2:1). The age of the patients ranged from 18-82 years with the mean age of 53.25. The most common indication of percutaneous dilatational tracheostomy was prolonged intubation and that accounted for 29(40.8%) of the patients which was followed by airway protection 27(38%) patients and to maintain the pulmonary hygiene was seen in 15 (21.1%) patients.*

Conclusion: *Tracheostomy is among the most frequently performed procedures in critically ill patients. Percutaneous dilatational tracheostomy is a safe and feasible procedure performed at bedside with minimal invasive technique in ICU.*

Introduction

Tracheostomy is the most commonly performed procedure worldwide.[1] It is mainly done in the critically ill patients requiring long term ventilation, facial trauma, laryngeal fractures, laryngeal malignancy, etc. Converting from endotracheal intubation to tracheostomy has many benefits in terms of maintaining the laryngeal function, feeding, safety and it is more comfortable than endotracheal intubation. Tracheostomized patients requires less

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analgesics and sedatives. It also helps in easier and early weaning from mechanical ventilator, possibility of speech, initiation of oral intake of medication. This all contributes to shorter ICU stay and hospital stay which becomes more cost effective.[2-4]The other advantage of percutaneous tracheostomy is it can be done in bedside and there is no need of transferring unstable and critically ill patients to the operating room. This method becomes cost effective and time effective in terms of use of manpower and equipment required.[5]

Shelden and his colleagues first reported percutaneous tracheostomy in 1955.[6] Several tracheostomy techniques have been described as percutaneous.[6,7] Several methods of percutaneous techniques came into practice. But the most popular technique which is being practiced was described by Ciaglar[8] as it performed rapidly and safely at the bedside.In the past open surgical tracheostomy was the only method and is one of the oldest known procedures known to mankind. Only after 1985, percutaneous dilatation tracheostomy was popularized and it became an alternative to traditional open surgical tracheostomy.[9]

The aim of this study is to record the learning curve, operative time, safety, complication and different hemodynamic parameters of the body during the percutaneous tracheostomy.

Methods:

This is a prospective observational study that was conducted in the 22 bedded Neuro Intensive Care and Medical Intensive Care Unit of Birat Medical College and Teaching Hospital, Kathmandu, Nepal. The cases were collected from 1st Aug 2021 to 28th Feb 2022.The written and informed consent for the inclusion in the study was taken from close patient's close relatives. Approval for the study was obtained from Institutional Review Committee.

The inclusion criteria for tracheostomy were patient requiring tracheostomy while the patients having any form of previous radiation of the neck, infection at the site of tracheostomy, age less than 18 years, bleeding diathesis, neck mass, history of neck surgery, patient with cervical injury and emergency tracheostomy were excluded from the study group.

Smith medical portex kit was used for the procedure. The procedure was done under the supervision of an anesthesiologist. Adequate sedation with midazolam or propofol and adequate analgesia with intravenous fentanyl were given to achieve anesthesia. Routine monitoring including ECG, heart rate, blood pressure and oxygen saturation were done.

The patient was positioned in supine position with head extension which was maintained by sand bag in the back of patient. Before the procedure the tube was pulled back such that the tip of the endotracheal tube was located just at the level below the vocal cord with Murphey's eye below the cord. The tube was then re fixed with tape.

Appropriate size percutantous dilator (no. 7,7.5,8) was selected for the patient. The site for percutaneous puncture was marked two finger above the sternal notch and was painted and draped. Injection 2% lignocaine with adrenaline (1:80000) was injected at the marked site. A horizontal incision up to the subcutaneous fascia was given and after that arteyforcep was used to split underlying tisse. A fourteen-gauge needle was used to locate the trachea and was confirmed by sudden loss of resistance and gush of air in the syringe. Once the needle sheath is inside the trachea, the guide wire was inserted till the white marking on the guidewire followed by A fourteen-gauge needle was used to locate the trachea insertion of the short dilator. The short dilator was removed leaving the guidewire in situ and the long guiding catheter was passed over the guidewire into the trachea in the direction of the arrow marked on the catheter. A well lubricated 'single stage dilator' passed over the guiding catheter until it reached the safety stop. Finally, the dilator was removed and well lubricated tracheostomy tube loaded on its introducer over the guiding catheter through the stoma with a slight twisting motion. The tracheal tube position was then finally confirmed by capnography. After that the tube was connected to mechanical ventilator.

Results:

Our study was a prospective observational regarding percutaneous dilatational tracheostomy. A total of 71 patients was included in the study. Out of which 39(54.9%) were male and 32(45.1%)were female with the ratio of (1.2:1). The age of the patients ranged from 18-82 years with the mean age of 53.25.

The most common indication of percutaneous dilatational tracheostomy was prolonged intubation and that accounted for 29(40.8%) of the patients which was followed by lower airway protection

27(38%) patients and to maintain the tracheo-bronchial toileting was seen in 15 (21.1%) patients.

The intraoperative and post operative complication was noted. Bleeding was the most common complication seen and it accounted for 9(12.7%) patients. Thisbv was managed during the interoperative period by applying pressure and suture. Seven patients were managed by pressure while two patients needed suturing. Five patients had stromal site infection. This was because of the excessive secretion and poor tracheostomy care. Stomal site infection was managed with daily dressing and applying dry Neosporin powder. Premature extubation was seen in four patients which was managed by reinsertion of portex tracheostomy tube.

Tracheostomy in faculty passage was seen in 3(4.2%) cases. This complication was noted immediately through capnograph. Transient hypotension was seen in 2 (2.8%) patients who was managed accordingly.

Tubal blockage was seen in 2 (2.8%) cases. This was managed by immediate removal of the tracheostomy and reinsertion of new tracheostomy tube in situ. Two patients had pneumothorax which was managed by insertion of chest tube by surgeons. Similarly, two patients showed tracheoesophageal fistula which was managed conservatively by inserting feeding tube and the patients was kept nil per orally for 7 days. While 42(59.2%) didn't have any kind of complication during the procedure and throughout their hospital stay.

The operating time for percutaneous dilatational tracheostomy was noted. The minimum time noted was 5 minutes while the maximum time noted was 25 minutes. The mean operating time was 11.87. The heart rate ranged from 78-122 beats per minutes with the mean of 93.97. The mean arterial pressure was between 61-110 mm of Hg with the mean of 84.34 during the procedure.

Discussion:

The purpose of our study was to find out the efficacy, operating time, complication and different hemodynamic paraments of the body during the percutaneous dilatational tracheostomy. The main advantage of percutaneous dilatational tracheostomy is the ability to perform it at the bedside in the ICU, thus avoiding a potentially hazardous transfer of critically ill patients to the operating room.

PDT has been shown to reduce significantly the cost of tracheostomy compared with surgical tracheostomy. The incision for percutaneous tracheostomy is relatively smaller compared to open surgical tracheostomy. The portex tracheostomy tube is fitted tightly against the stroma so that there is less tissue dissection and less damage to the tissue in PDT procedure. The advantages being shorter hospital stay and long term follow up studies who underwent PDT in terms of complication and aesthetically more favorable scar.[10-12]

A study conducted by Kearney et al[13] found out the perioperative complication was seen in 6% of the cases and premature extubation was the most common complication. Early postoperative complication in form of bleeding was seen in 5% of the cases. While in our study bleeding was the most common complication which was seen in 9(12.7%) of the patients. Early postoperative complication in form of bleeding was seen in 5% of the cases. The mortality rate was 0.6%.in the study conducted by Kearney et al.

In the study conducted by Toursarkissian et al[14] the mean procedural time was 15 ± 9 minutes (range 5-60 minutes) while in our study the operating time for the percutaneous dilatational tracheostomy range from 5-25 minutes with the mean of 11.87.

Percutaneous dilatational procedure is a closed procedure and has a unique risk of paratracheal insertion of tracheostomy tube insertion and posterolateral wall laceration. This complication has to be managed surgically with good outcome.[15]

There are certain situation in which open surgical tracheostomy is preferred over PDT like inexperienced surgeon, emergency placement of tracheostomy tube, in the condition where the anatomical landmarks are not clearly palpable like short neck, obese, enlarged thyroid gland, nonpalpable cricoid cartilage and gross shifting of the trachea.

Use of adjuncts like preoperative ultrasonography helps in identifying aberrant blood vessels thus preventing damage to the vessels and avoiding risk of bleeding. Based upon the preoperative ultrasound finding the Keling Et al[16] changed the site of tracheal puncture in 24% of the cases.The use of bronchoscopy during the procedure gives additional benefit of confirmation of needle placement, dilatation and tube placement.

Conclusion:

Tracheostomy is among the most frequently performed procedures in critically ill patients. Percutaneous dilatational tracheostomy is a safe and feasible procedure performed at bedside with minimal invasive technique in ICU. It has a very low morbidity if performed by skilled surgeon. The complication following percutaneous dilatational tracheostomy is relatively less. This technique is very cost effective as it can be performed in the bedside thus eliminating the use of operating room and extra man power. It also saves time for transporting the critically ill patients to the operating room. Thus this method is safe, cost effective and can be done in a bed side. It is believed that use of technical adjuncts like use of ultrasound and bronchoscopy will improve patient safety.

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