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Percutaneous tracheostomy: A review of 2 cases

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ABSTRACT

Background: Percutaneous tracheostomy to a large extent has replaced conventional surgical tracheostomy by virtue of its low incidence of complications and the rapidity with which the procedure can be performed at the bedside avoiding transport of critically ill patients to the operating rooms. Since it is a blind approach, bronchoscopic guidance has been suggested which is not always possible because of economic constraints.

Methods: A case study of 2 patients who had guide wire dilating forceps technique of percutaneous tracheostomy without the aid of a bronchoscope have been reported here. By ensuring the free mobility of the guide wire at each step of the procedure, a safe placement of the tracheostomy tube was achieved.

Results: The mean operating time in both the cases was nearly 6 mins. Both the patients did not have any complications. Both the patients were tracheotomised for permanent indication. One had severe dysphagia and TEF and could not survive long even after feeding gastrostomy. Other patient was referred to radiotherapy for stage IV supraglottic carcinoma larynx.

Conclusions: In the absence of bronchoscopic guidance, adopting the simple but effective precaution of free movement of guide wire at each step of the procedure, a safe tracheostomy tube placement is possible in an emergency as described in our report.

Introduction:

Tracheostomy is usually performed in patients who have obstruction of the upper airway in form of stridor as an emergency.[1] It is also done in non-obstructive indications where the patient need prolonged mechanical ventilation and frequent suctioning of broncho-pulmonary segments.[1] The percutaneous tracheostomy is a minimally invasive, effective and reliable procedure and has become the alternative to surgical tracheostomy.[1, 2]

Percutaneous tracheostomy was first described by the Italian surgeon Sanctorio Sanctorius in 1626 at the University of Padua.[3] The technique of percutaneous tracheostomy in modern times was described by Shelden in 1955 and has undergone several modifications over a period of time[3]. The currently used guide wire dilatational technique was introduced by the American surgeon Pasquale Ciaglia in 1985.4 Almost all percutaneous procedures in ICU set up in India are performed either by guide wire dilating forceps (GWDF) tracheostomy technique or by sequential dilation tracheostomy (classic Ciaglia) technique.[5]

Tracheostomy is a frequently performed procedure on patients receiving critical care.6, 7 Most of them are too ill and are connected to many machines which make it difficult and dangerous to transport them to operating theatres for formal tracheostomy.[6,8,9]

Percutaneous tracheostomy can be performed in the intensive care setting itself by the critical care team without imposing a strain on the surgeons' schedule.[6,8,9] It is associated with less intra and post operative complications including fewer stomal infections and reduced bleeding problems due to the tamponade effect of the tightly fitting tracheostomy tube[10]. Cosmetic results are better.[10] Clinically significant long term sequelae are no more frequent than the surgical tracheostomies.[11] It has been recommended that fibre optic bronchoscope should be utilized in this method so that procedural complications are reduced and accurate placement of the tracheostomy tube is achieved.[11] However, for logistic reasons this may not be routinely possible.[11] We report 2 unique cases of stridor managed by PCT in the intensive care unit in our medical college hospital.

Case Reports

2 cases reported with stridor to the emergency casualty of our medical College Hospital. Both were in severe stridor and medical line of treatment was given. The stridor did not subside and so percutaneous tracheostomy was planned. One was 52 year old male patient and the other 57 year old patient.

The first patient was admitted with intense stridor. Laryngoscopic examination revealed an irregular mass involving whole of the posterior pharyngeal wall and vocal cords not visualized clearly. So endo- tracheal intubation was not successful. An emergency PCT was done and the patient was stabilized.

His complete history was taken and investigated. He was having dysphagia since 2 years and breathlessness since 6 months. Oro- pharyngeal examination showed the involvement of the posterior pharyngeal wall. IDL examination showed pooling of saliva with posterior pharyngeal wall completely involved and postcricoid area involvement. The left sided vocal cords were fixed. Upper GI endoscopy was attempted but not successful, so a barium swallow was done. A tracheo- esophageal fistula and complete luminal narrowing of the upper 1/3 of the esophagus was detected on barium swallow. A feeding gastrostomy was performed.

The second patient too was admitted with intense stridor. He was given medical line of treatment and direct laryngoscopy showed a huge supraglottic tumor with fixity of the left vocal cords. Endo tracheal tube could not be maneuvered so an emergency PCT was done. After stabilizing the patient a complete history was taken and investigated. On IDL examination the patient had left sided supraglottic malignancy stage 4.Biopsy was taken with direct laryngoscopy and histopathology report confirmed it to be poorly differentiated squamous cell carcinoma. The patient was referred to radiotherapy.

In both the patients emergency PCT was done to establish the airway. PCT was tried successfully here because of the dire emergency, where both the patients could not be shifted to operation theatres. Here PCT was performed to relieve obstruction in the form of stridor.

Materials and Methods:

Usually the procedure requires 2 trained personnel, one to perform the procedure and the other to maintain the patient's airway and circulation, and to provide anaesthesia.6 Our patients were in stridor so no anesthesia was given but airway and circulation was maintained. Usually in an ICU set up when PCT is being done endotracheal tube is withdrawn to the laryngeal inlet and patient maintained with 100% oxygen.[6] Neck was extended with pillows under shoulders.[6] The head should be maintained in the midline.6 The suprasternal notch and the surface markings of the laryngeal framework structures are marked[6]. The skin incision should approximate to the 1st and 2nd, or 2nd and 3rd tracheal rings6. The PCT kit consists of a scalpel, 14 guage IV needle and canula, 10 ml syringe, flexible Teflon-coated guide wire, plastic dilator, pair of tracheal dilating forceps, tracheostomy tube with hollow obturator to slide over the guide wire (fig 1). [6]

Tracheal forceps have a groove in the jaws to allow their passage around the guide wire (fig 2).[6] The tube cuff should be fully deflated prior to insertion. Then, 3 ml of saline should be drawn into the 10ml syringe via the 14 G canula.[6] 10 ml of 1% lignocaine with 1:200000 adrenaline is used to infiltrate locally.[6] A 1.5 – 2 cm incision is made at the midpoint of the distance between the lower border of the cricoid and the sternal notch.[6] After blunt dissection anterior tracheal wall may be palpated.[6]

A 14 G canula with the syringe attached is inserted in the midline and aspirated as he goes in the trachea.[6] Successful tracheal puncture is indicated by a sudden air entry into the syringe.[6] Now the syringeand needle are removed leaving the canula at the tracheal opening.[6] Now the guidewire is inserted through the plastic canula for approximately 10 cms and checked for its free movement.6 The canula and the guide wire introducer are removed leaving the guide wire in the trachea (fig 3).

After making small incision the 14- French dilator provided in the kit was passed over the guide wire dilating the tissues, following which the dilator was removed leaving the guide wire.6 A small horizontal skin incision of 1-1.5 cm was made across the guide wire insertion site and the GWDF was passed over the guide wire into the trachea.[6] The free movement of the guide wire in the GWDF ensured correct placement[6]. The GWDF was opened using both hands to dilate tissues just enough to accept the tracheostomy tube and the GWDF was withdrawn in the open position.[6] The tracheostomy tube obturator along with the tracheostomy tube was now passed over the guide wire into the trachea (fig 4).[6] Free movement of the guide wire was once again ensured. The guide wire and the obturator were removed leaving the tracheostomy tube in the trachea, which was secured firmly.[6] Suctioning was performed after removing the obturator and the ventilation was established through the tracheostomy tube.[6]

Discussion:

Tracheostomy is frequently performed in critically ill patients requiring prolonged mechanical ventilation and tracheal toilet[1]. Percutaneous tracheostomy is preferred over the conventional tracheostomy, as it can be rapidly performed at the bedside with fewer complications.[8,9] The incidence of complications with percutaneous tracheostomy varies with the different techniques used.[6,12]

The peri-procedural complication rate with GWDF technique is reported to be 1-10%.[6,12] Leinhardt et al have reported that complication rates are not different with different techniques and also noted that PCT could be performed faster without necessitating patient transfer to operation theatre.[13] Some authors have also suggested use of fibre optic bronchoscope to reduce the procedural complications.[14,15] This has been mainly due to the fact that bronchoscopy can help to verify the safe placement of needle and guide wire.[14,15] However, a survey carried out by Cooper et al in 1998 revealed that only 31.3% centres routinely use fibreoptic bronchoscopy during percutaneous tracheostomy.[16] This may be due to logistic reasons or related to some reports of increased airway pressure leading to its sequel such as increased intracranial pressure, pneumothorax and hypoxia associated with PCT performed with bronchoscopic assistance.[8] A more serious complication, a large posterior wall tear of trachea leading to tension pneumothorax has also been reported with bronchoscopic assisted percutaneous tracheostomy.[14,15] Although, the incidence of peri-operative complications has been reported to be similar with and without bronchoscopy (7% and 6% respectively), the complications were more serious in patients in whom bronchoscopy was not used.[8,17] These included perforation of posterior tracheal wall and one death due to tension pneumothorax.[8,17] In Anon et al study, following GWDF technique there had been a tracheal tear with concomitant subcutaneous emphysema and lowering of PaSO2.[19]

We performed percutaneous tracheostomy in both of our patients using GWDF technique without the aid of bronchoscope. The placement of needle in the trachea was confirmed by free aspiration of air as well as bubbling of air through the drop of fluid placed over the hub of the needle. In addition the free movement of guide wire at each stage of the procedure was taken as prerequisite for proceeding further. By strictly adhering to these simple precautions, we were able to achieve successful and accurate placement of tracheostomy tube in all our patients without any major complications. In our study, there was no desaturation, accidental extubation, endotracheal tube or cuff puncture. The only complication encountered was persistent secretions from the stomal opening after the procedure which needed persistent suctioning in both the patients. Apart from this there were no other complications of the procedure. We did both PCT without bronchoscopic assistance so paramedian puncture of trachea and superficial posterior tracheal wall injuries cannot be ruled out. The duration of the procedure in both of our patients was nearly 6 minutes which is comparable to some other studies with duration of 4.3 to 13.6 min.[19,20]

The percutaneous tracheostomy is very useful compared to the conventional tracheostomy.[1,6] Percutaneous tracheostomy has already replaced the surgical route in several intensive care units and it is indeed the procedure of choice in the majority of cases.[1,6] This is attributable to the fact that, in experienced hands, it is safe, easy and quick, and there is no need to move the patient to the operating room.[1,6]

Perioperative complications are at least comparable with those of surgical tracheostomy and most of them are minor. With proper patient selection, operator experience and attention to detail, complication rates can be reduced that may have an influence on late complications.[21]

An important advantage of PCT over the surgical route is the very low rate of stomal infection.[21] Several reports have also shown that PCT kit is bit costlier than conventional tracheostomy, which is of course important in Indian set up.[5] Despite all the virtues of the percutaneous technique, the role of conventional tracheostomy in cases with contraindications for PCT, difficult anatomies and failed PCTs remains unchallenged.[6] The decision on which method to use should solely be made depending on the clinical situation and the experience of the operator.[6] PCT must be performed by surgeons or by critical care intensivists with enough experience in emergencies.[6]

Conclusion:

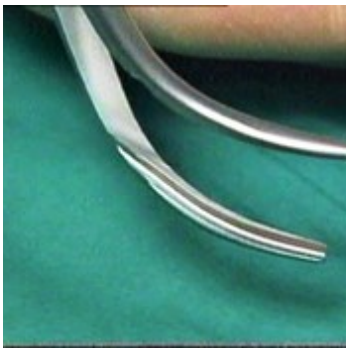
The discussion on the routine use of bronchoscopy during PCT is not yet settled18. There is no adequate controlled study on the superiority of routine bronchoscopic guidance during GWDF tracheostomy[18]. However, it is indispensable for medical college training and during PCT on patients with difficult anatomy[18]. Moreover, a bronchoscope must be at hand during PCT in case an emergency situation arises[18].

The technique must be judged by their safety, ease of performance and long-term effects, not merely by the rapidity with which they can be performed[18]. We conclude that percutaneous tracheostomy using GWDF technique is a simple, rapid and safe bedside procedure. By adopting the simple precautions described above, results as good as those that have been achieved using a bronchoscope can be obtained.

Guide wire in the trachea moving freely

All instruments in PCT set

Tracheostomy tube being loaded over the guide-wire



Grooved edge of guide wire dilating forceps

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