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Original Research Article

An innovative method for retrograde tracheal intubation using prolene suture and enteric feeding catheter

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Abstract

Retrograde intubation is a well established technique for intubating a patient with difficult airway. Since the first description of retrograde intubation in 1960 several modifications have been reported. However, all techniques require a cricothyroid membrane puncture by a thick needle usually <16G, and specialized catheters. We have devised a novel technique of retrograde intubation using a 20G intravenous catheter, prolene suture (size 0) and an enteric feeding catheter (EFC) size 14F for retrograde intubation. All of the required items are economical and easily available in operation theatre. Till now, we have successfully used this technique in seven patients with difficult airway.

Keywords: tracheal intubation, prolene suture, cricothyroid membrane puncture

1. Introduction

Retrograde intubation is a well established technique for intubating a patient with difficult airway. In this technique, a guide wire is passed into the trachea which is then withdrawn from mouth or nose. A tracheal tube is then passed down over the guide wire until it enters the trachea [1]. Since its first description in 1960, several modifications of retrograde intubation have been reported [2,3]. Recently some specialized retrograde intubation kits have also been devised. All documented techniques require a cricothyroid membrane puncture by a thick needle usually 16G, and specialized catheters which are costly and usually unavailable in operation theatres. We have devised a new method to accomplish retrograde intubation using a 20G intravenous catheter, prolene suture (size 0) and an enteric feeding catheter (EFC) size 14Fr. All of the required items are economical and easily available in operation theatre.

2. Materials and Methods

After approval from institutional ethical committee, the procedure was carried out in an established case of airway difficulty. The following inclusion criteria were used:

Unrestricted neck extension and palpable cricothyroid membrane. Known hypertensive's, cardiac patients and patients on anticoagulants were not included.

During pre-anaesthetic evaluation, the procedure was explained to the patient and a written consent was obtained. Alprazolam 0.5mg was administered night before surgery. In the pre-operative room injection glycopyrollate 0.01mg/kg/IV; injection midazolam 0.03mg/Kg IV; injection ondansetron 4mg/IV were administered for antisialogue, anxiolysis and anti-emetic action respectively. Patient was asked to undergo lignocaine gargles so as to anaesthetize the oral cavity. If nasal intubation was planned, a pledget soaked in lignocaine with adrenaline was inserted in both the nostrils.

2.1 Equipments required

In the operating room a kit comprising of the following items was prepared intravenous cannula:20G prolene suture size 0, EFC size 14F, xylocaine 10% spray, two 5ml disposable syringes, two 25G hypodermic needles, preservative free lignocaine 2% injection, endotracheal tubes size ranging from 6.5-8.0 internal diameter, a sterile needle holder.

2.2 Preparation of equipments

An appropriate size disposable PVC ETT is selected and then loaded over enteral feeding catheter [EFC]. The tip of enteral feeding catheter is cut just at its end. Needle of suture is also removed.. A mark is made on the feeding catheter at the length where the machine end of ETT coincides with it. The purpose was to estimate the length of ETT in terms of enteral feeding catheter [EFC]. (Figure 1)

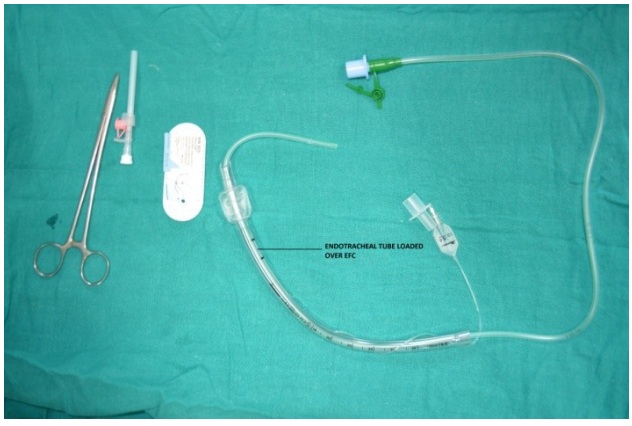

Figure 1: Enteral Feeding Catheter [EFC]

2.3 Procedure

2.3.1 Technique for orotracheal intubation

After application of routine monitors (NIBP, SPO_2, ECG), bilateral superior laryngeal nerve block was performed by injecting 2ml (1ml on either side) of preservative free lignocaine solution (2%). After ensuring adequacy of SLN blockade, cricothyroid membrane was punctured using 20G intravenous canula. At the point of loss of resistance inner metallic trocar is withdrawn and leaving the cannula *in situ* (Figure 2). Trans-laryngeal placement was confirmed by aspiration of air.

Figure 2: Technique for orotracheal intubation

Through the cannula 2.5 ml of preservative free lignocaine 2% solution was injected at the end of full expiration, so as to anaesthetize the trachea. After lignocaine injection, the usual response of the patient was coughing. When cough subsided, a size 0 prolene suture was passed through the cannula and the patient was asked to expire forcefully which aided in upward movement of the suture. When the suture reached epiglottis, the patient began to feel something in the mouth, which he was asked to bring out through tongue movement. The prolene suture was then pulled out through the patient's mouth (Figure 3).

Figure 3: Pulling out of prolene suture through the patient's mouth

An assistant was asked to hold the other end of the suture with a sterile needle holder to prevent its complete withdrawal.

At the oral end, the suture was tied with a size 14F enteral feeding catheter loaded over by ET tube of appropriate size. Suture was then pulled out through its tracheal end, with the goal to intubate trachea by the tied 14F size enteral feeding catheter. Other end of EFC was then connected to ET tube connector of size 5.5 and further to the anaesthesia circuit. Now, successful placement of EFC in trachea was confirmed by the presence of CO_2 in expired air as indicated by $ETCO_2$ monitoring. [Through the EFC oxygen was also administered to the patient.] After this ETT was guided in to the trachea using EFC as guidewire, The prolene suture was kept tense at its tracheal end with the aim to keep EFC in position.(Figure 4)

Figure 4: Showing the prolene suture was kept tense at its tracheal end with the aim to keep EFC in position

If resistance was encountered during intubation the, ETT was rotated counter clockwise along with pushing movements. When desired length of ET tube is passed into the trachea, EFC along with the prolene suture was pulled out though the machine end of ETT. IV cannula from the cricothyroid membrane was also pulled off. Patient was then induced with IV induction agent and paralyzed with an intermediate acting non depolarizing muscle relaxant.

2.3.2 Technique for Nasotracheal intubation

The technique remained same and here also patient was asked to bring the prolene suture out through the mouth. However in nasal intubation, 14F size EFC was passed through nose with the aim to bring it out through mouth, by the help of patient himself. As both feeding catheter and prolene suture come out through the mouth, they are tied in the manner similar to oral intubation. After this EFC was pulled through nose till the suture at tracheal end began to move, the aim was to consolidate the oral fold of EFC. Here also suture was then pulled out through its tracheal end, the goal was to perform nasotracheal intubation by EFC. ETT was then guided over EFC. Post intubation procedure was same as after oral intubation.

3. Discussion

It is not uncommon to see a patient with difficult airway, posted for an incidental or related surgery. Under both the circumstances it poses difficulty for anesthetic management. Use of fibreoptic laryngoscope may be the method of choice in an anticipated difficult airway. However, in the presence of bleeding this may also end up in failure. Further in many centres the scope may not be available due to the absence of fiberoptic laryngoscope. Alternative options should be available for such situations. The retrograde tracheal intubation is one of the possible technique that seems to be simple and quick in experienced hands and is indicated in various clinical situations [4] including cervical and facial trauma [5] and limited mouth opening.[6-8]

In the traditional technique of retrograde intubation, an epidural catheter is passed into the airway through cricothyroid puncture and brought out of the mouth. This catheter is then used as a guide for intubation. Though it is one of the established method of difficult airway management, it is seldom used routinely [9], due to its invasiveness and technical failure. To enhance the success rate of the technique, the infracricoid puncture or the introduction of the guide wise through the distal lateral eye of the ETT has also been proposed [10].

However, all these techniques require a cricothyroid puncture with a thicker needle and thus are more traumatic. Moreover the specialized guide wires are costly and are usually unavailable in operating room routinely. Also in many cases it is cumbersome to railroad ETT over the thin catheter.

The technique used by us is simple, less traumatic, economical, and requires equipments easily available in operation theatre. Sterilization was not an issue as all of the following items are either disposable or pre-sterilized. We have used this technique in seven patients till now, out of which three patients were of mandible fracture, one was of TM joint ankylosis, three were of submucosal fibrosis with restricted mouth opening (one was posted for laparoscopic cholecystectomy, one for laparoscopic hernia repair, one for nephrolithotomy).

The idea of using prolene suture comes on the basis of the fact that when patient feels something in upper respiratory tract he tries to expectorate it out through the mouth. Prolene is a relatively stout suture and is preferred because it is less likely to get coiled when compared with silk suture of same size. In all the seven cases there was no difficulty in getting the suture out through the mouth, infact the patient himself brought the suture at the level of incisors, through initial forceful expiration and then via movements of tongue.

It is logical that ETT may be tied directly to suture or may be glided via murphy's eye but in past experiences of using the single guide wire technique, the ETT during its passage over the guide wire was often obstructed at the level of epiglottis. To prevent this we conceived the idea of using an EFC for initial intubation. EFC is of thin calibre and is least likely to get obstructed via epiglottis. In our case series the EFC passed without any problem. Moreover EFC can be used for oxygenation before passing the desired size ETT. Passing ETT over EFC was rather easy due to relatively less difference in their diameters and out of seven only two cases required counter clockwise rotation of the ETT (one required 90^0 and other 270^0).

3. Conclusion

To conclude, use of prolene suture and EFC for retrograde intubation, makes it an easier procedure, since it negotiates the bends and curves in the airway without much difficulty. Moreover, it is less traumatic. All the required items used in the above technique are economical and are always available easily in operating rooms.

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