

A novel placement technique for nasogastric and nasoesophageal tubes

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Abstract

Background – Early enteral nutrition in dogs and cats can have significant benefit in the therapeutic management of critical illness. Blind placement of nasogastric or nasoesophageal feeding tubes to accomplish this goal has become standard practice. However, complications from tube misdirection into the tracheobronchial tree can lead to significant patient morbidity and mortality. Safe and consistent alternatives are desirable to minimize these risks.

Key Concepts – A modified method for placement of nasoenteric tubes is described. The main variation from standard procedure involves a second tube measurement, with the distal tip of the tube positioned at the thoracic inlet and measured to the nostril. The tube is advanced to this level and tested for negative pressure using a 12 mL syringe attached to the end of the feeding tube. This improves confidence in esophageal positioning before complete advancement of the tube to its distal endpoint.

Significance – This procedural adaptation to feeding tube placement has the potential to reduce bronchopulmonary trauma from intratracheal misdirection by providing an early safety check to identify malpositioning. Prospective validation studies are needed to support its advantages over standard tube placement techniques.

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Abbreviations

NET nasoesophageal tube
NGT nasogastric tube

Introduction

Early enteral nutrition has gained strong support as an essential component of the therapeutic management of many intensive care and critically ill dogs and cats. It is well recognized that early implementation of a feeding plan can have significant benefit on the recipient, especially in terms of minimizing patient morbidity and mortality. In human medicine, inadequate or delayed nutrition can lead to a cumulative caloric deficit, manifested by a mortality increase of 25–32% in critical

illness.¹ The incidence in veterinary patients is not established but early enteral feeding is supported by its main advantages, including preservation of gastrointestinal integrity, improvement in immune function, reduction in bacterial translocation, and release of inflammatory mediators.²

There are several modalities described for enteral feeding tube placement but of particular interest are the nasogastric (NGT) and nasoesophageal (NET) tubes. These tubes confer the benefits of easy placement and immediate use with often minimal or no sedation, allow for maximum utilization of the gastrointestinal tract, are inexpensive and provide a short-term and immediate solution for a patient's nutritional needs, gastric decompression, and content removal.³ Despite these advantages, complications can arise secondary to placement or maintenance of the tube. These have been well documented in human and veterinary medicine and include tube malpositioning in the tracheobronchial tree, pneumothorax, abscessation, pneumonia, acute respiratory failure, tracheal perforation, bronchopleural fistulas, and even death.^{3,4} Also reported is epistaxis, dacrocystitis, rhinitis, vomiting, pneumomediastinum, hemothorax, isocalothorax, and subcutaneous emphysema.^{3–5}

To avoid potentially life-threatening pulmonary complications from tube misplacement, several

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methodologies have been recommended. These include air insufflation and auscultation, elicitation of a cough during placement or after saline infusion, aspiration of gastric contents and pH or bilirubin determination, capnography, laryngoscopic visualization, and various radiographic approaches.^{3,6} The disadvantages of these practices have been previously described, questioning their dependability and reproducibility for proper tube placement.^{3,7} Currently, confirmation by radiographic evaluation is the gold standard in human and veterinary medicine. To improve successful tube placement and minimize complications in people, a two-step x-ray method outlined by Roubenoff and Ravich in 1989 has been recommended.^{5,8} A recent veterinary case report reviewing intrapleural NGT placement suggested a modified version of this practice, adopted to minimize the significant morbidity associated with bronchopulmonary malpositioning.⁹ In this latter technique, the NGT is measured to the level of the 4th or 5th intercostal space, inserted to this level and radiographed for position in the esophagus. This avoids inadvertent placement of the tube into the bronchopulmonary region if intratracheal misdirection was achieved. Once placement is confirmed in the esophagus, the tube is advanced to the appropriate level and radiographed. Concerns for this technique lie with its increased cost and labor intensiveness, additional radiation exposure, and superfluous movement of a critical patient.⁹

The purpose of this report is to outline an alternative method of NGT and NET placement that has the potential to minimize the risk of intratracheal tube malpositioning and its associated pulmonary complications while avoiding the disadvantages associated with prior techniques. This procedure has not been previously described in the literature and may be an easy and practical approach to rapid enteral support.

Materials and Methods

Instrumentation needed to perform this technique includes a feeding tube of any construction and size, with or without a weighted tip or intraluminal stylet, topical 0.5% proparacaine, 22-Ga needle, 3-0 nonabsorbable suture, permanent marker, Elizabethan collar, 12 mL syringe, and 2% lidocaine topical lubricant. Any sedation and anesthesia may be given as necessary, without affecting the methodology.

To perform the NGT or NET placement, the patient is best positioned in sternal recumbency on an examination table. The head is lifted momentarily to place 2–3 drops of 0.5% proparacaine into the preferred nostril, followed by a thin application of 2% lidocaine topical lubricant over both nares. This latter exercise allows for less nasal stimulation should inadvertent touching of the

nares occur during tube placement. After these topical anesthetics are applied, the tip of the tube is measured from its distal endpoint to the nostril and marked with permanent marker at that level. Landmark for placement into the stomach is the 13th rib, and for NE positioning, the 7th to 9th rib spaces are used (Figure 1). The tip of the feeding tube is then positioned at the level of the thoracic inlet and measured to the nostril, where it is marked a second time with permanent marker (Figure 2). This measurement is designed to estimate the distance where the tube just inserts into the esophagus. Once at this level, the tube can be verified for proper placement, prior to full insertion to its distal endpoint. This minimizes bronchopulmonary trauma should the tube unintentionally enter the trachea. Also, just prior to the tube mark at the level of the larynx is the approximate location where the patient's swallow reflex is expected and can be encouraged by gently massaging the neck during placement.

The feeding tube can be secured with surgical stapling or suturing with one method described herein. Prior to feeding tube insertion, a stay suture is placed in the lateral alar fold of the preferred nostril. This is accomplished by inserting the 22-Ga needle into the nasal tissue and feeding the 3-0 nonabsorbable suture through the bevel end. Once threaded, the needle is removed from the nose and the suture material will stay in place to be tied loosely down over four knots, creating the stay suture (Figure 3). Placing this suture first allows for immediate securing of the tube once it is placed and it avoids unnecessary tube dislodgement from patient movement.

For tube insertion, the head should rest in a straight, forward facing position. This natural posture encourages an awake or mildly sedated patient to swallow the tube into the esophagus during placement. Lifting or lowering the head makes this swallowing motion more difficult. The 2% lidocaine lubricant can be used to moisten the tip of the tube. The muzzle is held securely with one hand while the tube is quickly inserted caudoventrally and medially into the ventral meatus of the nasal passage with the other. If nasal turbinates are met, the tube is partially removed and repositioned more ventral and/or medial. Pushing the external nares dorsally can serve to facilitate tube advancement if difficulty occurs.¹⁰ When the tube is positioned close to the mark at the thoracic inlet, gentle massaging of the neck can help facilitate swallowing of the tube into the esophagus. If a swallowing motion is detected, the tube should be rapidly advanced to the designated mark. If not detected or if the patient is unable to swallow appropriately, the tube should be advanced to the mark and then tested to verify positioning. This is done by attaching a 12 mL syringe to the end of the feeding tube and aspirating back the tube for



Figure 1: (a) Nasogastric tube measurement with the distal tip positioned at the 13th rib, measured to the nostril. (b) Nasoesophageal tube measurement with the distal tip positioned between the 7th and 9th rib spaces, measured to the nostril.



Figure 2: The distal tip of the feeding tube is positioned at the level of the thoracic inlet and measured to the nostril. This second measurement estimates the location where the feeding tube just enters into the esophagus.

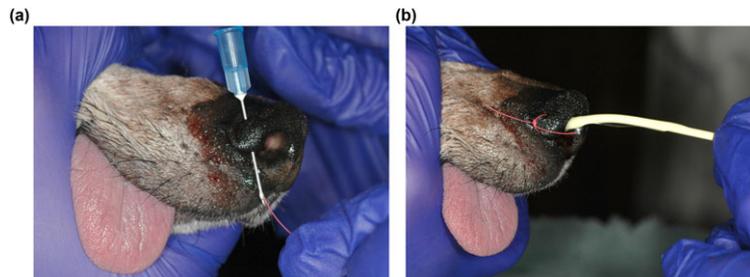


Figure 3: (a) Positioning of the 22-Ga needle in the lateral alar fold of the nostril with polypropylene monofilament nonabsorbable suture threaded through the needle's bevel end. (b) Stay suture positioned in place through the lateral alar fold of the nostril. The feeding tube is inserted after placement of this suture.

negative pressure (Figure 4). Esophageal placement will yield negative pressure when the tube is aspirated but insertion into the trachea will result in continuous suction of air. This aspiration technique can be performed even in feeding tubes that have indwelling intraluminal stylets. The syringe can be securely attached to the end of the stylet and aspirated as previously described. Once negative pressure is confirmed, the tube is slowly advanced and tested by aspiration a second time, approximately halfway between the first and second marks, before the

tube is fully inserted to its distal endpoint. If negative pressure is not achieved, the tube is withdrawn past the oropharynx and repositioned again.

After placement, the tube can be secured to the stay suture by passing 3-0 nonabsorbable suture under the stay suture and the tube, keeping the ends of equal length. This is then tied firmly to the tube using a surgeon's throw to seat it on the tube without slipping, followed by 3 additional knots to reinforce the hold. As both suture ends are long, this knot can be immediately incorporated

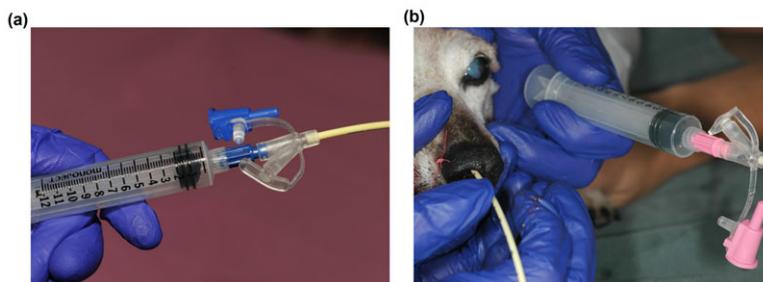


Figure 4: (a) A 12 mL syringe is attached to the feeding tube for aspiration. In this case, the syringe is attached to the tube's intraluminal stylet in the nasogastric feeding tube that is being placed in this patient. (b) Testing for negative pressure with a 12 mL syringe attached to the end of the feeding tube's intraluminal stylet after the tube has been positioned at the level of the thoracic inlet in this patient.

into a modified Chinese finger trap, consisting of crossing the suture under the tube and tying it securely on top using a surgeon's throw and one additional knot, keeping the suture placement close together but not overlapping. This modified Chinese finger trap pattern is repeated another 3 times with the last suture knotted several times for added security. The tube can then be fastened by suture or surgical staples to the lateral aspect of the face or over the dorsal muzzle. An Elizabethan collar is immediately placed to avoid patient tube dislodgment and a standard postplacement thoracic radiograph is taken to confirm proper positioning.

Discussion

As part of the growing advancements of intensive care medicine, early enteral nutrition has been emphasized as an essential element in the therapeutic management of critically ill dogs and cats. NE and NG feeding tubes have been instrumental in providing this immediate nutritional support, with often mild to no sedation required. However, concern for significant complications and patient risk make alternative methods of placement desirable to minimize patient morbidity and mortality, in particular as it relates to intratracheal misdirection. The overall incidence of tracheal misplacement in human medicine ranges from 0.3–15%,³ with a recent study reporting a 1.9% overall mean malposition rate, with pneumothorax and patient death described in that population.⁴ The intratracheal risk statistics are unknown in veterinary medicine but presumed to be significant as blind placement is commonplace procedure.

As such, identification of safer and consistent methods to avoid potentially life-threatening complications is of fundamental importance for our veterinary patients. Equally significant is the need to create a cost effective, labor sensitive technique that can have universal and time-saving application. The technique described herein is a novel adaptation of a standard practice, with the po-

tential to minimize intratracheal complications. It can be adopted by any practice and by any skill-leveled practitioner. It does not require additional equipment, staffing, or patient movement and can be performed with or without sedation as needed.

Other strategies exist to decrease patient risk of complications but these are inconsistently employed in veterinary practice. Auscultation for stomach air bubbling has been described but can be misleading in cases of pleural effusion.⁷ Patients with intratracheal malpositioning may not always exhibit a cough, and those with a depressed mental status or under sedation or anesthesia can have a blunted response.³ Stomach tube aspiration may also be inaccurate due to inability to collect fluid and mistaking other body effusions for gastric contents. pH determination of the gastric fluid may be falsely altered in patients on gastric protectants.^{7,11} Laryngoscopic assisted placement is inappropriate if patients are not anesthetized and even with radiographic techniques, there are limitations in terms of cost and staffing, especially if a two-step procedure is employed.³ Capnography and electromagnetic tracing may not be clinically practical nor available for widespread use in all settings.^{1,3}

In human medicine, patient monitoring and technique evaluation have been implemented as means to improve outcome with feeding tube positioning. These include proper placement training for staff, verification of correct placement via radiographs, evaluation of the tube for migration and patency, and documentation on observations, assessments, and patient management with standardization of protocols across hospital settings.¹² Technique evaluation and standardization in veterinary medicine can offset risk to our patients and provide safe practice for enteral nutrition. Incorporation of added safety measures such as this procedure modification can provide one means to accomplish this goal.

Disadvantages of this technique are presumed limited over standard practice but prospective studies are needed to address its potential shortcomings as

evidence-based support for this method is currently lacking. Future validation studies can provide more objective evidence when comparing this technique over standard methods, particularly in terms of its conceivable advantages and disadvantages. The hypothesis that it allows for earlier identification of intratracheal misplacement and thus minimizes bronchopulmonary trauma and its associated risks has yet to be supported. Investigation into the utility and success rate of this method for accurate esophageal tube placement over standard procedure is needed in clinical cases. However, this approach, albeit still blinded, affords an opportunity to improve confidence in the tube location before complete tube advancement and based on repeated clinical experience with the technique, the author encourages this simplistic modification to NGT or NET placement in dogs and cats.

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