CIRA Case of the Week
July 2016

Case Courtesy of Drs. H. Hennessey, B. Cook, C. Cousens, E. Mercer

McGill University/Memorial University

Case Report

- Mrs. K, a 68 y/o F patient in the ICU on ET intubation had required a tracheostomy for long term mechanical ventilation.
- Why is this a presentation for an IR group?
  - As no ENT surgeon or Intensivist qualified to perform this procedure in the region (Corner Brook, NL) was available, Vascular Interventional Radiology was consulted.

Case Report

In our patient clinical landmarks were not apparent due to body habitus.

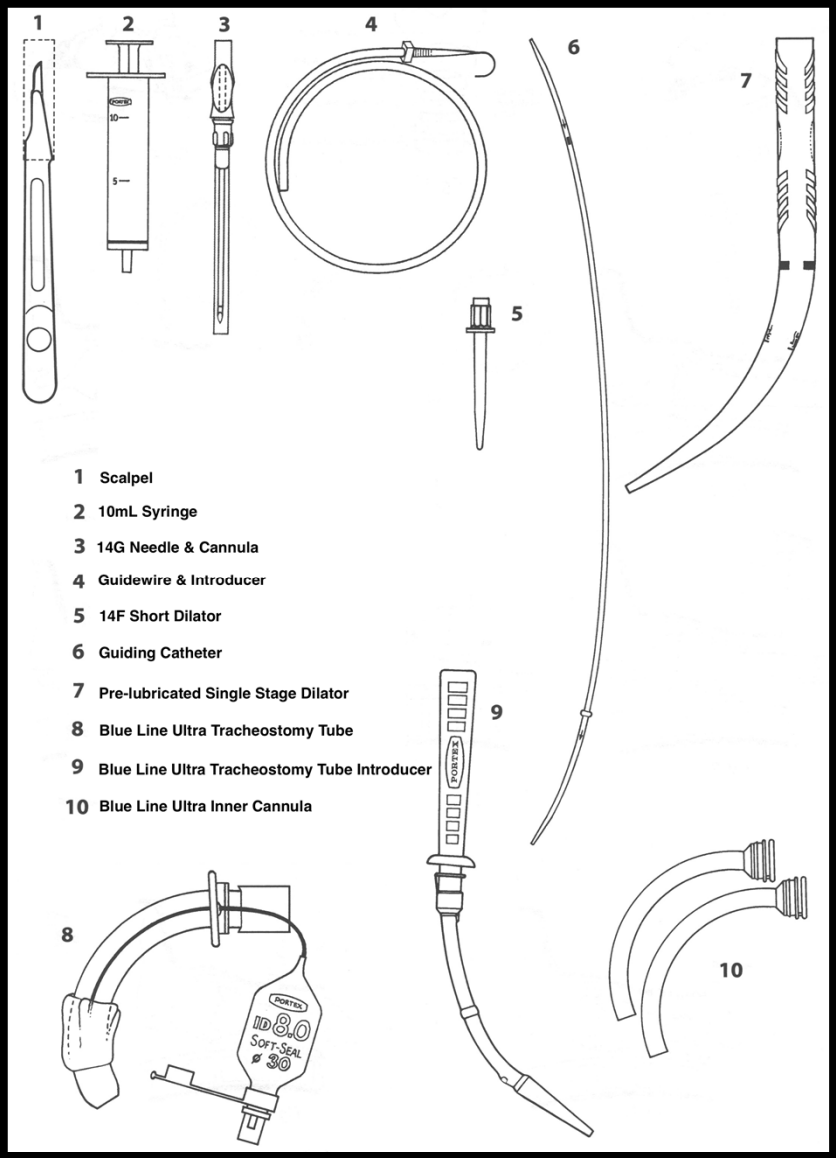
This usual absolute contraindication to PDT was addressed and avoided by performing the PDT procedure in the IR suite and identifying radiological landmarks via ultrasound and fluoroscopic guidance.

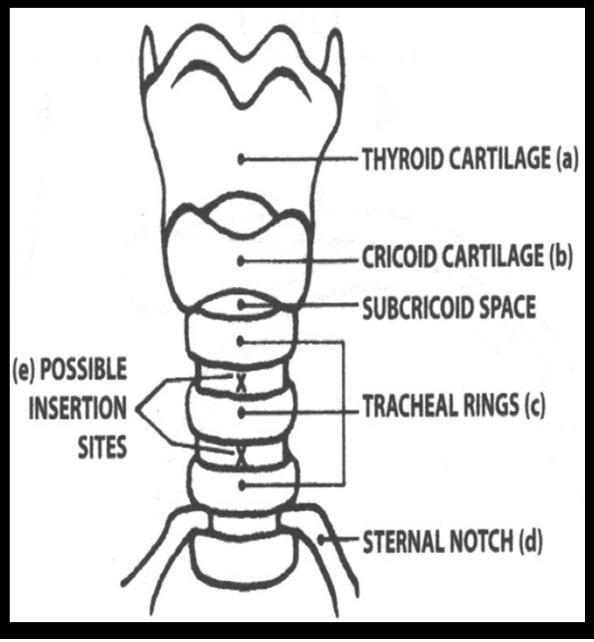
Kit Contents

ULTRAperc

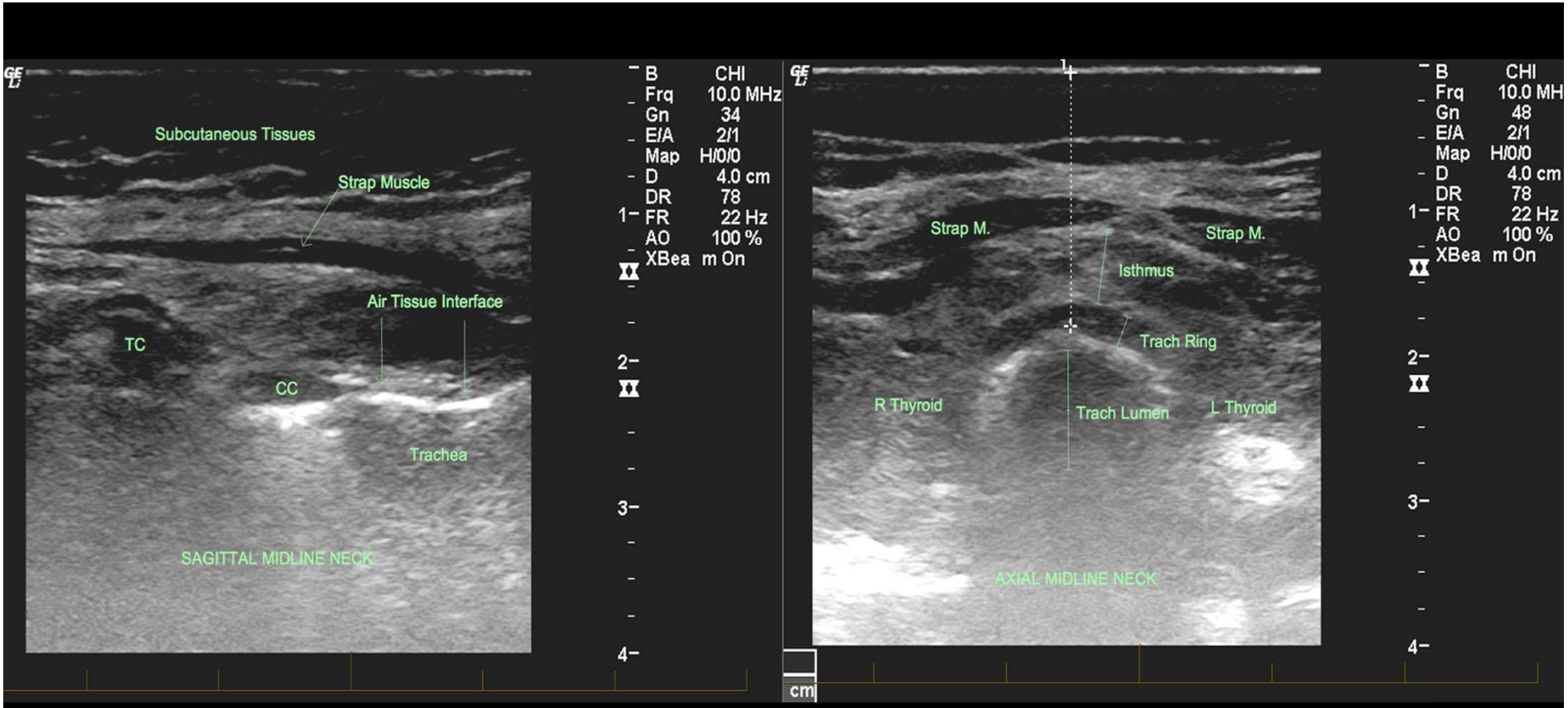
smiths medical
bringing technology to life

PERCUTANEOUS TRACHEOSTOMY KITS

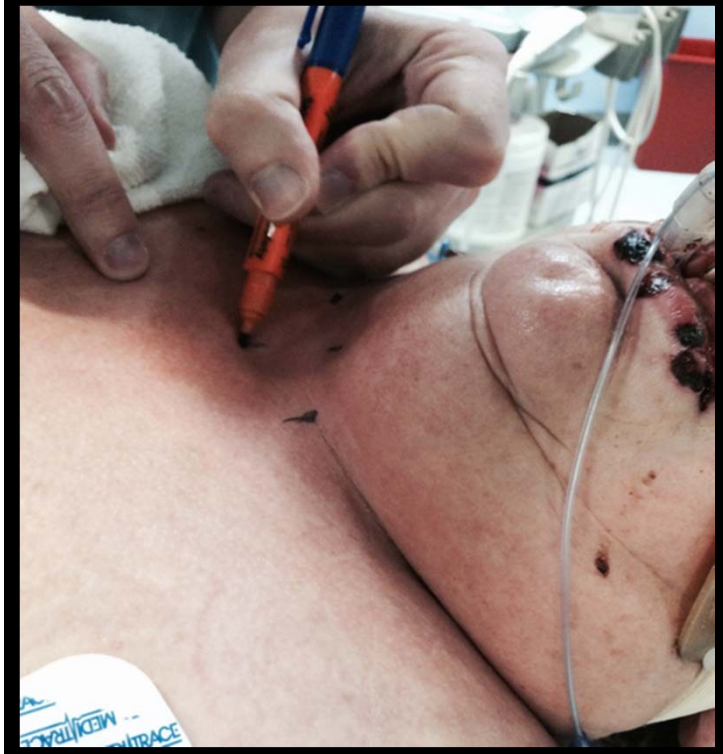




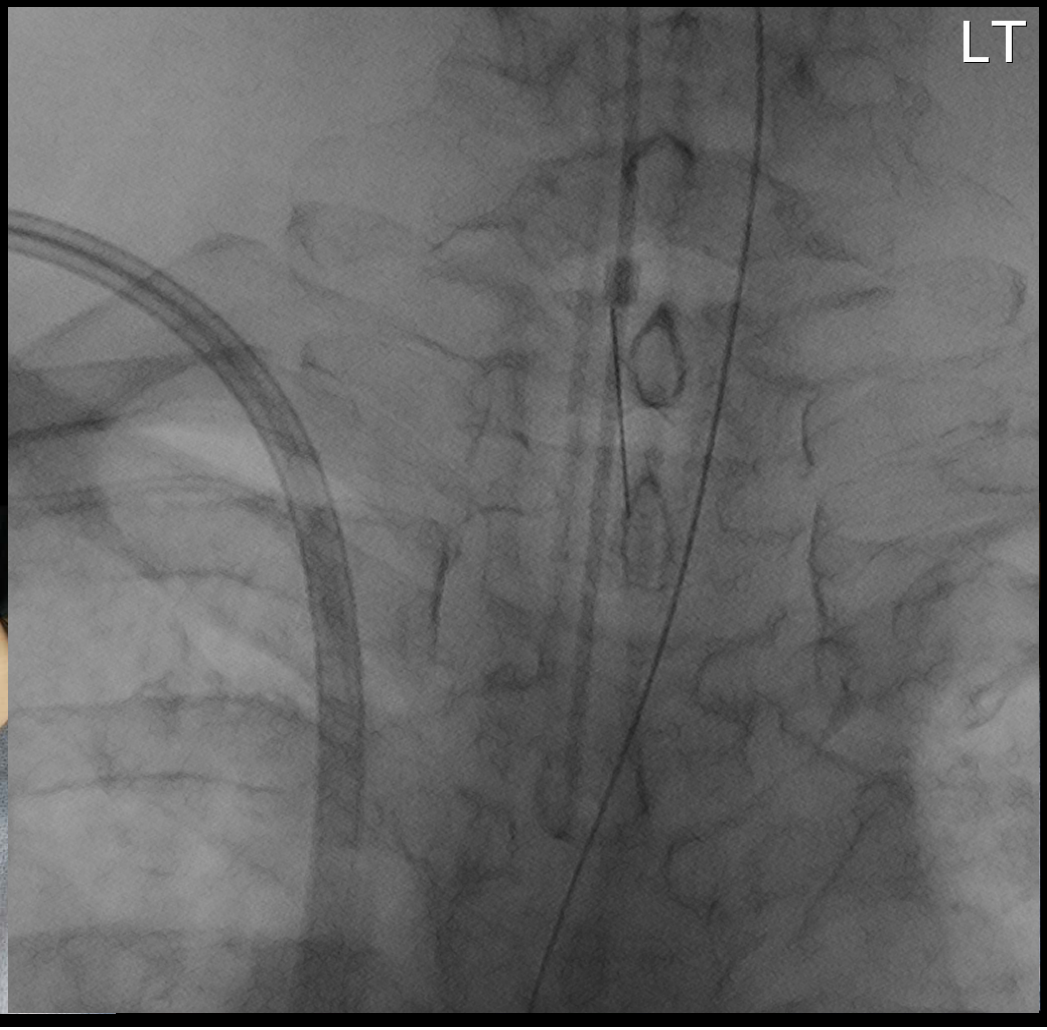
The patient was placed supine and pillows positioned under the shoulders to hyperextend the neck.

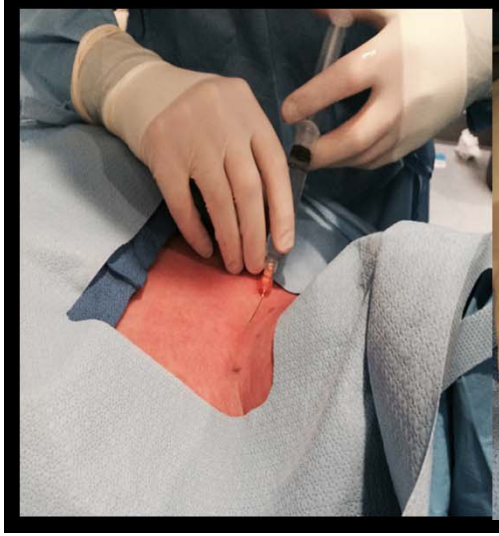


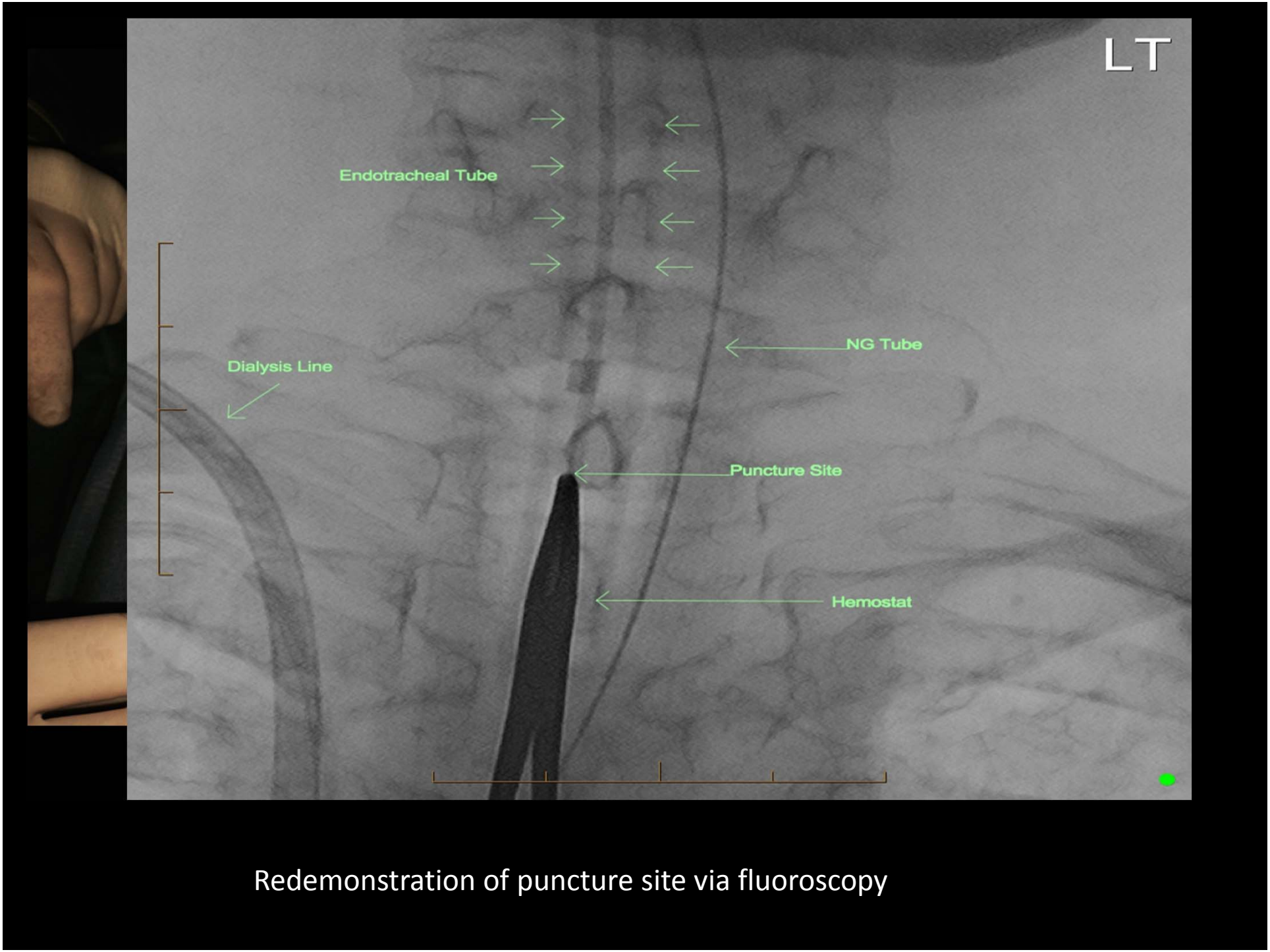
Ultrasound was used to identify anatomical landmarks including the thyroid cartilage (TC), cricoid cartilage (CC), tracheal rings, thyroid gland and strap muscles. It was also used to confirm that no superficial midline vascular structures were present (e.g. anterior jugular veins).



A target was marked between the 1st and 2nd tracheal rings and position confirmed fluoroscopically.

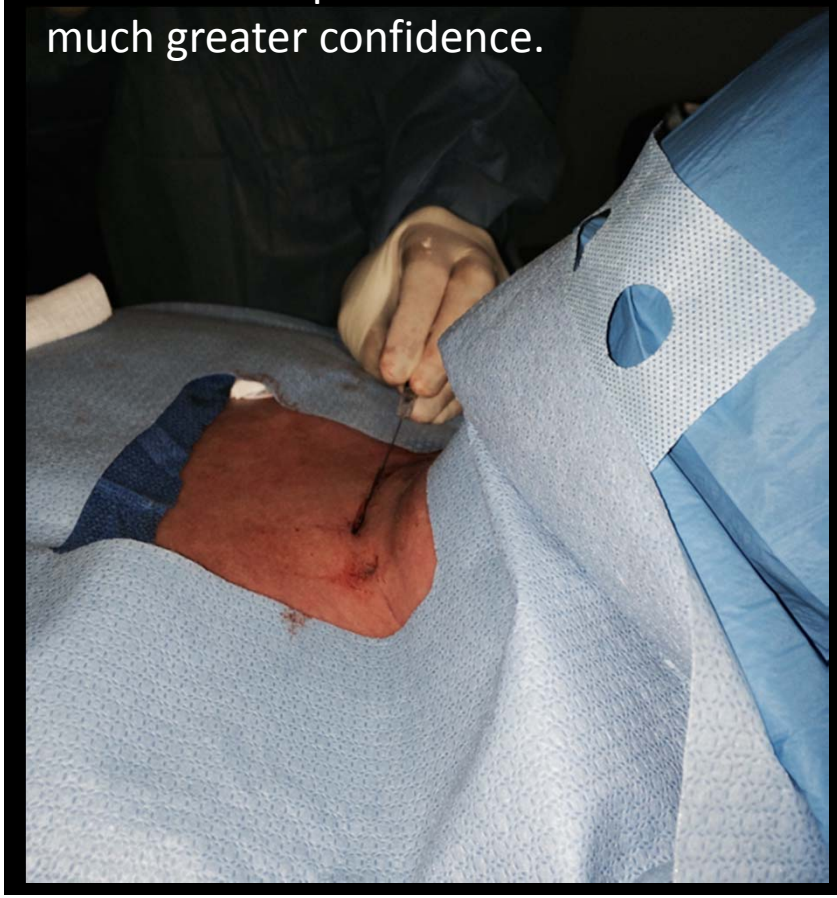


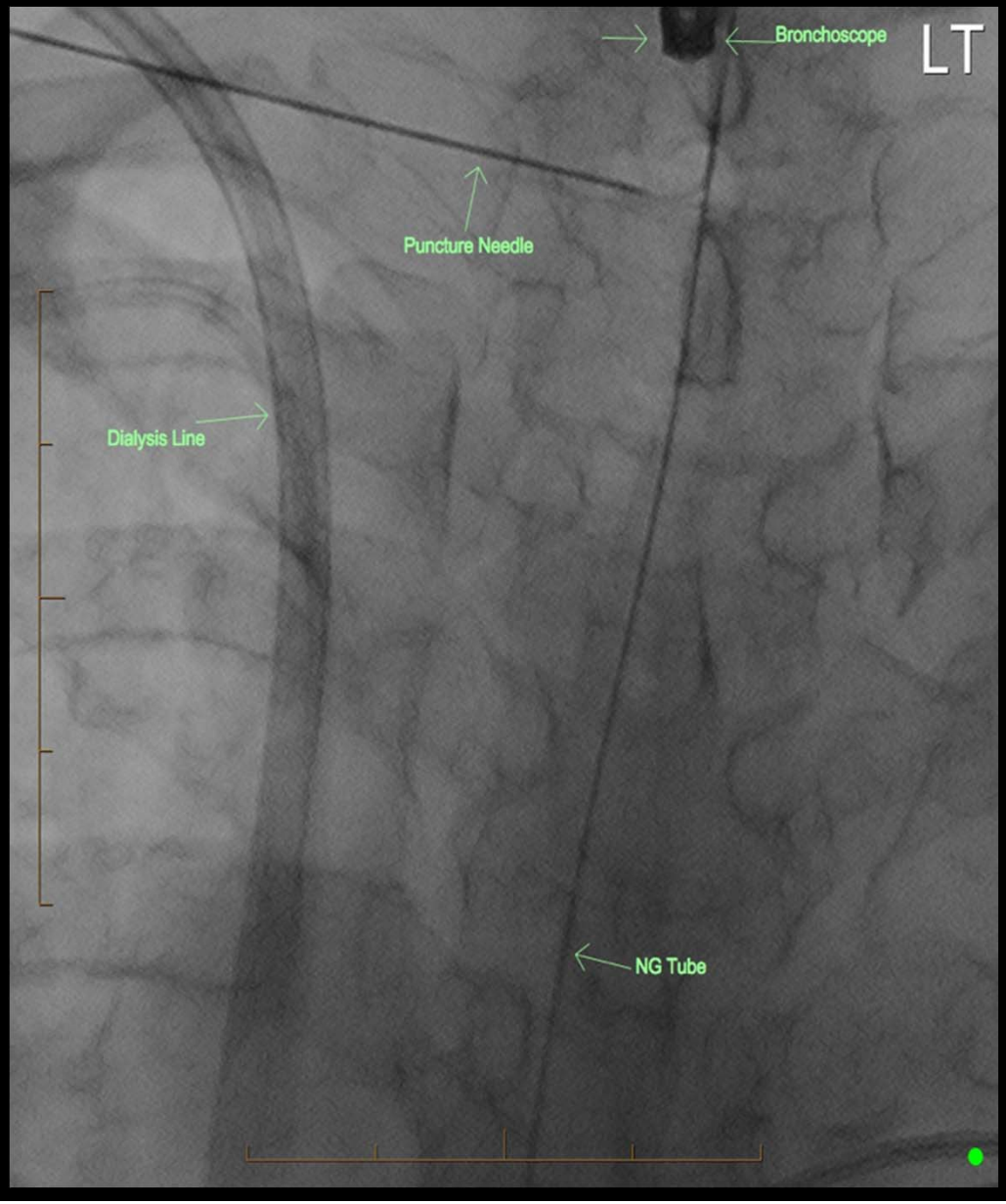


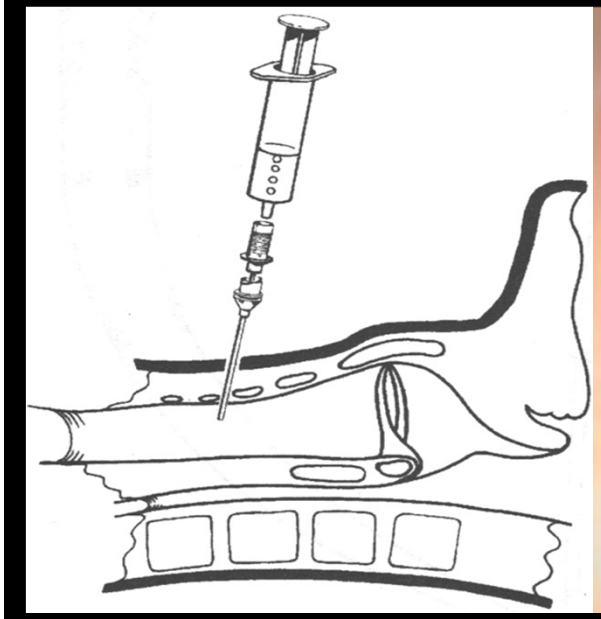


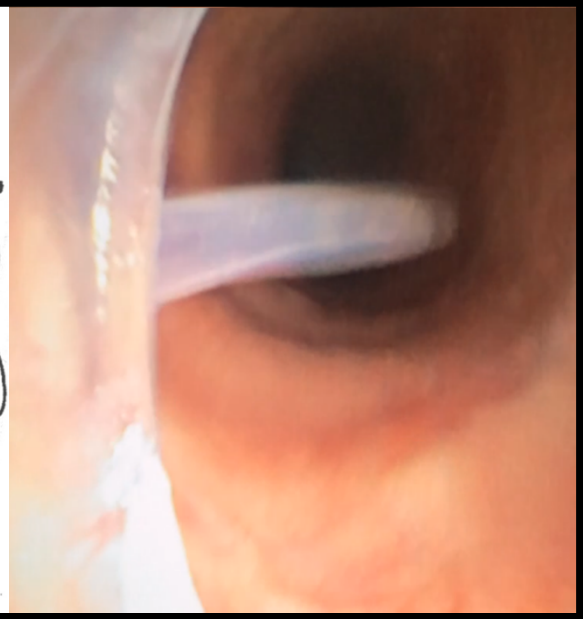
Redemonstration of puncture site via fluoroscopy

Next, the tip of the ET tube was retracted above the proposed puncture site to avoid inadvertent tube puncture. This is typically performed with direct bronchoscopic visualization alone, which can be challenging; however, we were able to mark the proposed puncture site with a needle to allow combined bronchoscopic and fluoroscopic tube retraction with much greater confidence.

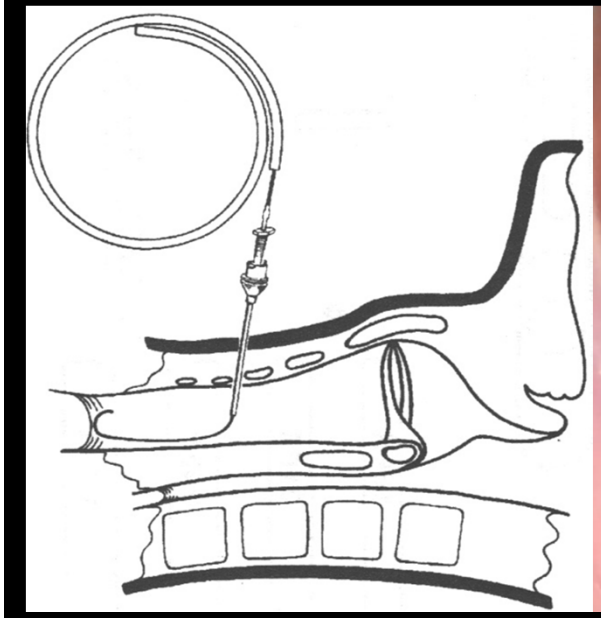


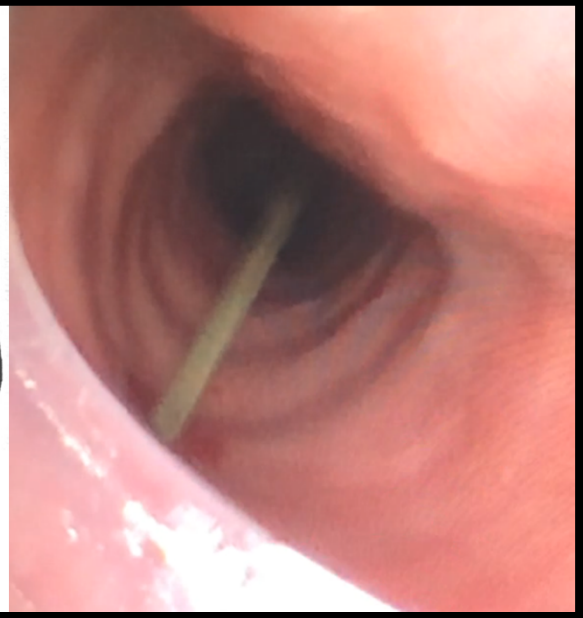






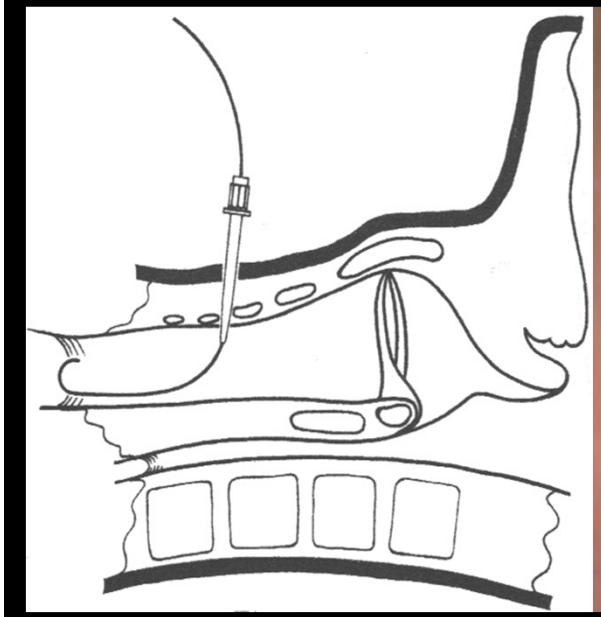
The 14G needle/ cannula supplied in the tracheostomy kit was advanced in the midline, angled slightly caudally, using fluoroscopic guidance.

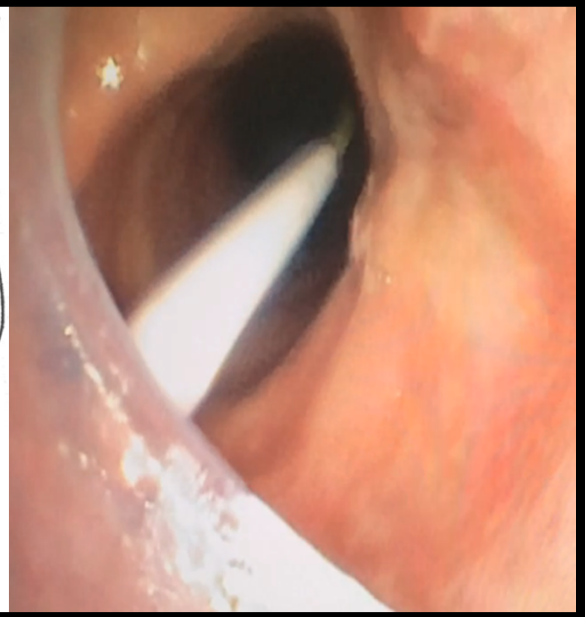




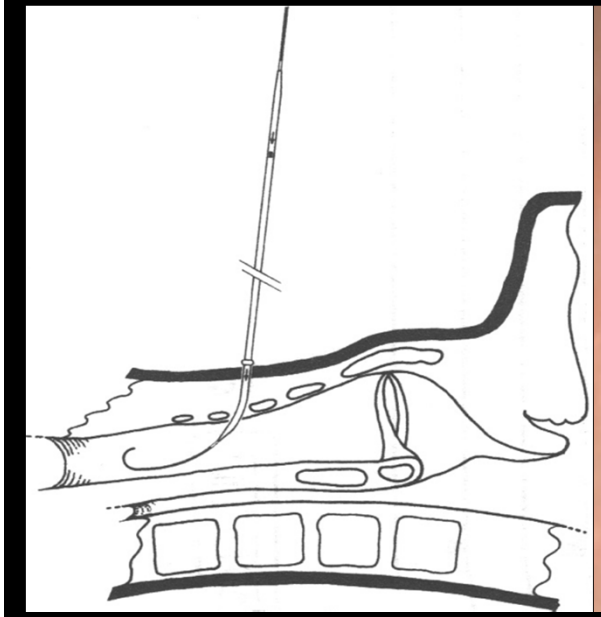
The needle was removed leaving the cannula in place and intra-tracheal position was confirmed by aspiration of air and bronchoscopically.

The cannula was advanced off the needle and the guidewire placed.

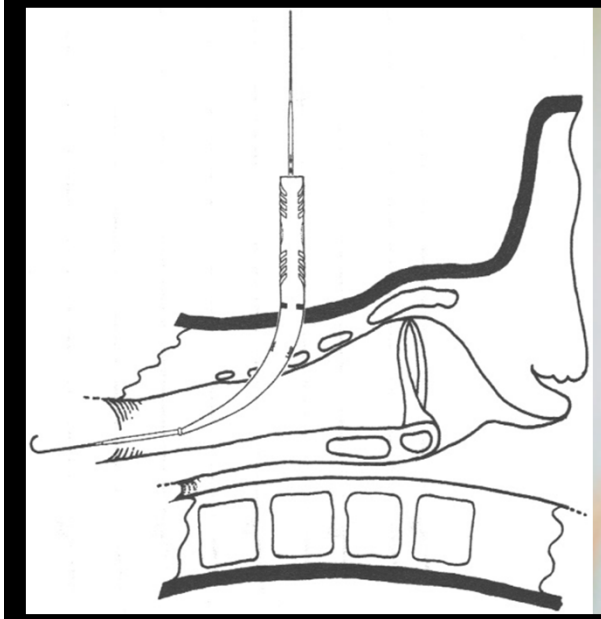


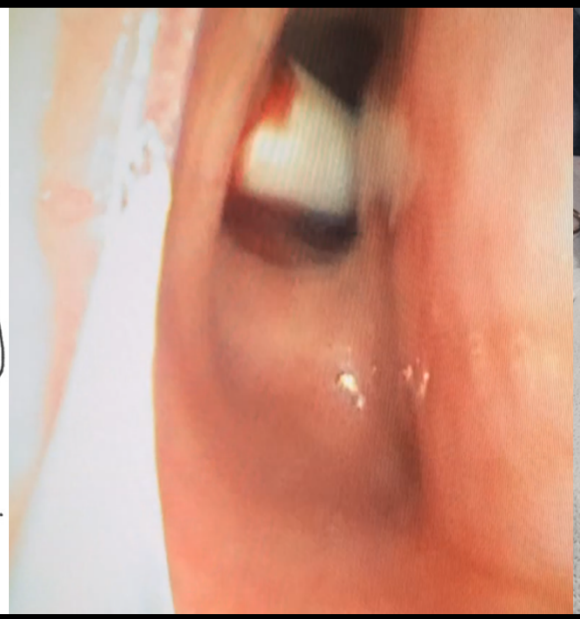


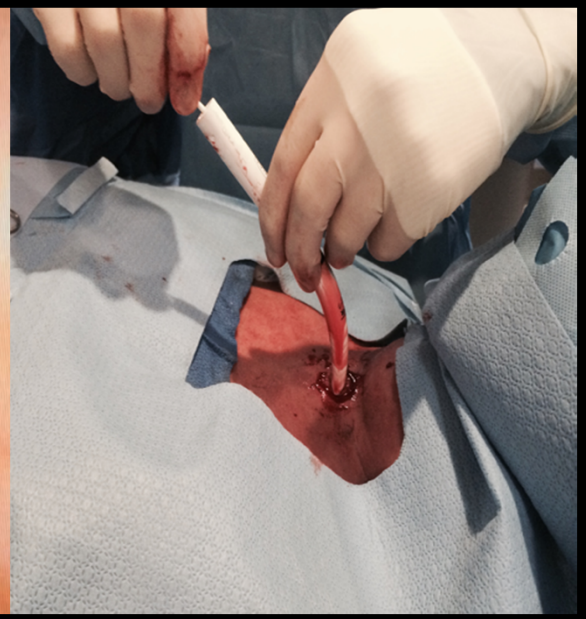
Over the guidewire and using gentle twisting movements, the 14F short dilator was pushed to penetrate the anterior tracheal wall.

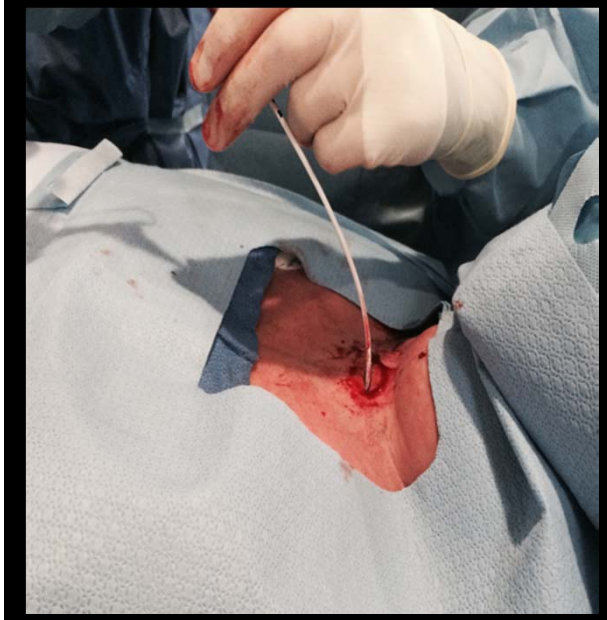


The guiding catheter was then passed over the guidewire until a safety stop marker reached the skin surface. The markers on the catheter were used to determine depth of insertion.





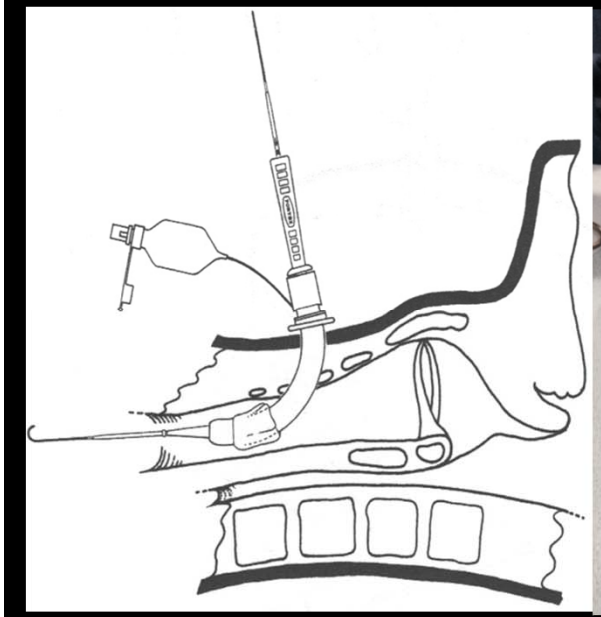


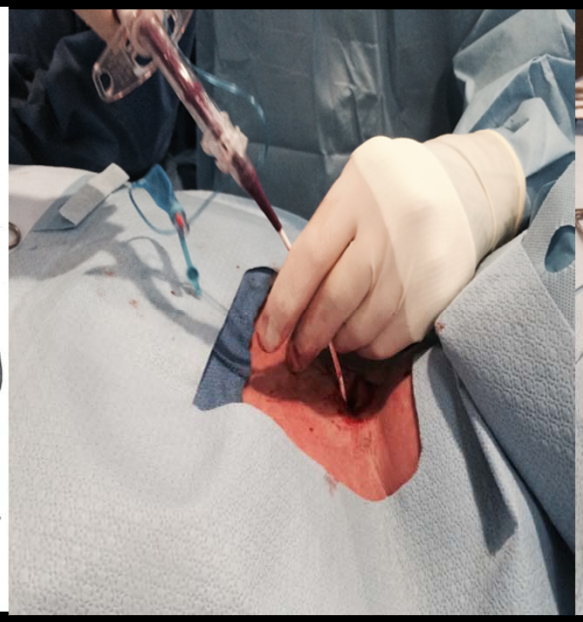


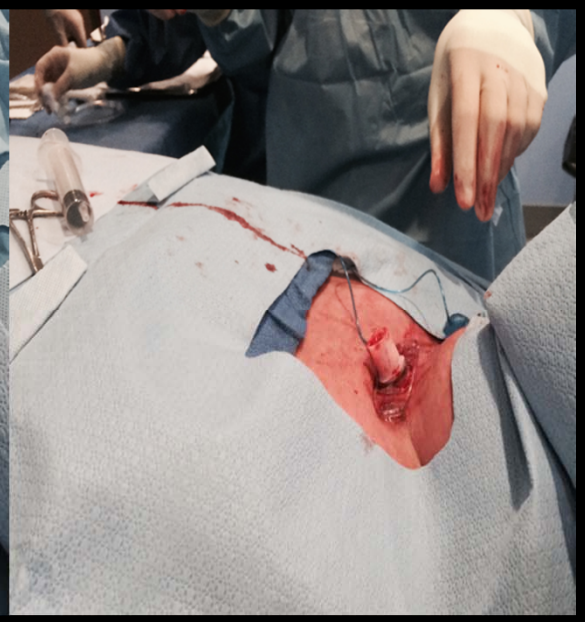
The ‘single stage’ dilator was immersed in sterile saline to activate a lubricated coating and advanced over the guiding catheter until it reached the safety stop. In this position, a proximal mark on the guiding catheter was just visible at the handle end of the dilator.

The dilator was then removed leaving the guidewire and guiding catheter in the trachea.

Confirmation of correct position was confirmed by the observation of air exiting through the stoma and bronchoscopically.



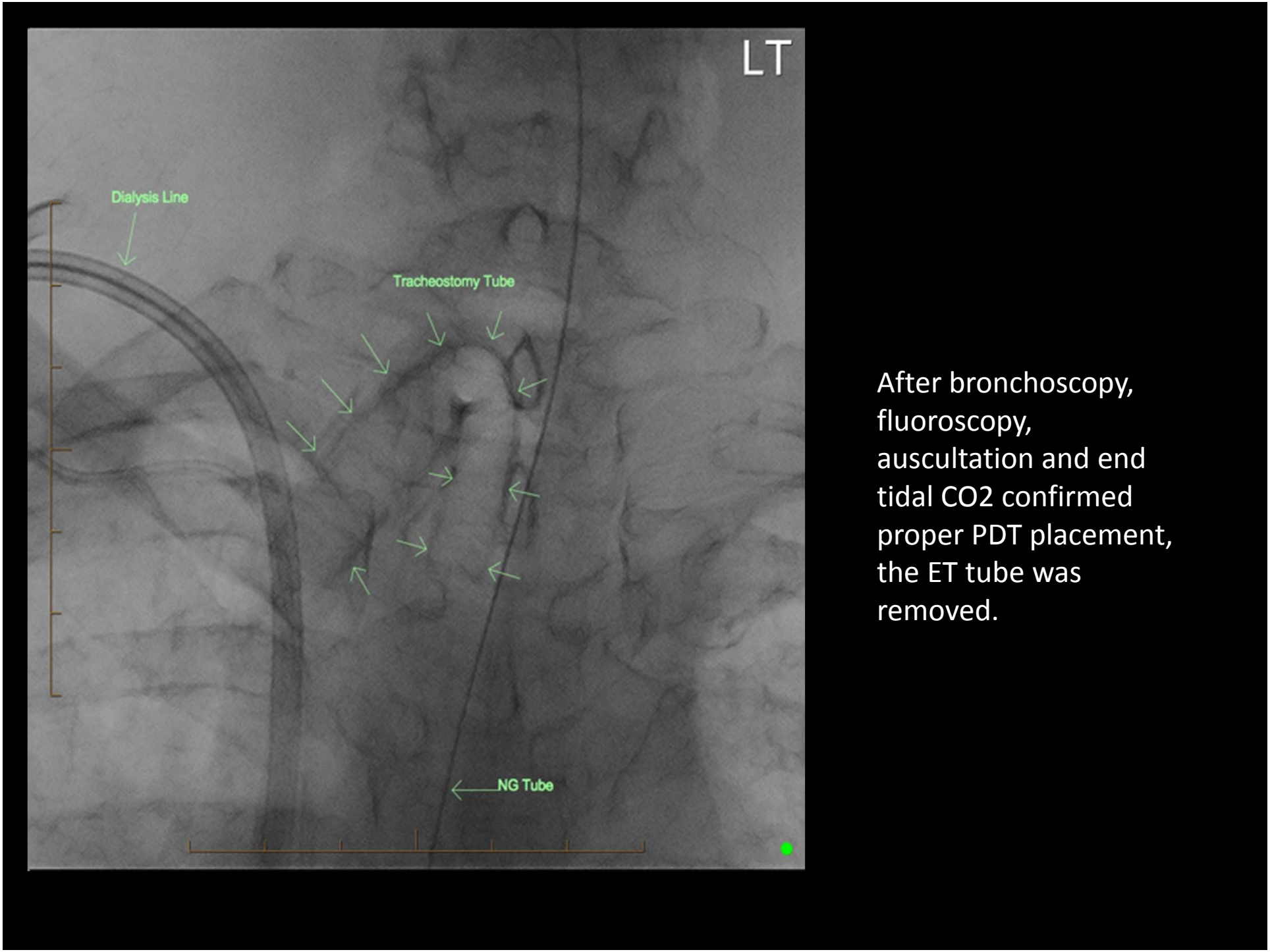




The lubricated tracheostomy, loaded on its introducer, was inserted using slight twisting motions over the guiding catheter.

The introducer, catheter and guidewire were removed and the airway suctioned.

The ventilator was then transferred to the tracheostomy. The cuff was inflated with adequate air to form a seal.



After bronchoscopy, fluoroscopy, auscultation and end tidal CO2 confirmed proper PDT placement, the ET tube was removed.

Percutaneous Dilational Tracheostomy

- Airway access for mechanical ventilation in the acute setting is typically provided by peroral endotracheal tubes (ETs)
- Conversion to a tracheostomy is usually considered when long term ventilation is anticipated.
- Percutaneous dilatational tracheostomy (PDT), an alternative to surgical tracheostomy, is the elective placement of a tracheostomy using the Seldinger or similar techniques.
- It is typically a faster, safe, less expensive procedure with better cosmetic results than surgical placement, when performed by experienced physicians.

Percutaneous Dilational Tracheostomy

- In our rural medical center, without access to specialists trained in this procedure, the Vascular Interventional Radiology group has used our expertise in anatomy, imaging and percutaneous techniques to establish a PDT service.

- PDT placement is usually performed at the bedside (typically in the ICU) by identifying clinical anatomical landmarks, and the inability to define these landmarks is usually an absolute contraindication to the procedure.

Contraindications to PDT Placement

- Absolute Contraindications:
  - Emergency surgical airway management (in emergency, cricothyrotomy is the procedure of choice).
  - Pre-existing infection at the tracheostomy site.
  - Pre-existing malignancy at the tracheostomy site.
  - Uncertainty in identifying the anatomical landmarks.
  - Unstable cervical spine fracture.
- Relative Contraindications: (Risks in these situations must be balanced against the benefits of the procedure)
  - Enlarged thyroid gland.
  - Previous surgery at the tracheostomy site (e.g. thyroidectomy).
  - Bleeding diathesis (e.g. due to anticoagulant therapy).
  - Pre-existing tracheomalacia.
  - Morbid obesity (skin to trachea distance may render tracheostomy tube too short).

Peri/Post-Procedural Management

- Have appropriate personal, including an anesthetist with bronchoscopy experience
- Reduce hemorrhage risk
  - Use of lidocaine with epinephrine reduces microvascular bleeds
  - INR <1.5 and platelets >50,000
  - US to identify vascular anatomy (e.g. anterior jugular veins)
  - Bleeding kit ready (electrocautery & right-angle forceps with 3.0 silk ties)
- Managing obstruction (usually due to poorly seated PDT tube with cuff malposition resulting in partial occlusion of the PDT lumen distally)
  - Worsens with greater cuff inflation
  - Deflate cuff and readjust under fluoroscopy or bronchoscopy
  - Change tube or use extension devices
  - If all fails, replace ET tube
- Managing leak (despite increased cuff inflation, usually a result of tracheomalacia)
  - Distal extension device allows for new cuff landing site to bypass the area of malacia

Complications

- Major (3 % rate)
  - Bleeding requiring intervention or surgery
  - Desaturation
  - Tension Pneumothorax
  - False Passage
- Minor (18 % rate)
  - Bleeding controlled by pressure
  - Tracheal tube or cuff puncture
  - Air leakage
  - Tracheal wall injury or subcutaneous emphysema
  - Hypotension

References

- Silvester W, et al. Percutaneous versus surgical tracheostomy: a randomized controlled study with long-term follow-up. Crit Care Med. 2006;34(8):2145-2152.

- Cosgrove JE, et al. Locally developed guidelines reduce immediate complications from percutaneous dilatational tracheostomy using the Ciaglia Blue Rhino technique: a report on 200 procedures. Anaesth Intensive Care. 2006;34(6): 782-786.

- Portex® Percutaneous Dilation Tracheostomy, Smiths Medical Int. Ltd., Hythe, Kent, UK