percutaneous tracheostomy

indications

(i) Prolonged mechanical ventilation
(ii) 50-70% of tracheostomies in intensive care patients
(iii) Airway obstruction
(iv) Pulmonary toilet
(v) Prophylaxis (prior to head or neck resections)

techniques

PDT – Ciaglia Technique
- Developed 1985
- Dilational
- Seldinger Technique
- 'Blind' insertion (air bubbles in syringe to verify tracheal placement)
- Insertion in between cricoid and first tracheal ring
- Modified Ciaglia technique
- Insertion site more distal away from cricoid to prevent cartilage stenosis
- Bronchoscopic assistance (reduces complications from 16.8% to 8.3%)
- Single dilator instead of multiple dilators
- Currently standard of care
- Kost et al: prospective randomized trial of 500 patients showed overall complication rate of 9.2%, most commonly oxygen desaturation (2.8%) and bleeding (2.4%)
- Decanulation (1%) (80% on pt. with BMI > 30), infection (0.8%)
- Advantage: confirm correct needle placement, prevent posterior tracheal wall injury, prevent accidental extubation
- Disadvantage: impaired ventilation and oxygenation, additional personnel, increased cost and time

Rapitrach
- Developed by Schachner et al 1989
- Utilizes Seldinger Technique
- Blades of Dilating Tracheotome are slid over wire to dilate
- Increased risk of posterior tracheal wall injury
- Significantly more complications than Ciaglia technique

Griggs Technique
- Developed 1990
- Uses Seldinger Technique
- Blades of Dilating Tracheotome are slid over wire to dilate
- Increased risk of posterior tracheal wall injury
- Faster than Ciaglia
- Significantly more complications than Ciaglia technique

Translaryngeal Tracheostomy
- Described by Fanconi et al 1993
- Technique: the tracheostomy is passed through the larynx and upward through the anterior wall of the larynx
- Advantage: prevents pressure and damage to posterior wall
- Disadvantage: procedure more complicated (technique and airway management)

Percu Twist (2002)
- Single step screw dilator
- Seldinger Technique
- Does not compress anterior tracheal wall
- Decreased risk for posterior wall injury

contraindications

Absolute
(i) Emergency
(ii) Pediatric patient (<15 years)
(iii) Midline neck mass

Relative
(i) PEEP > 20
(ii) Uncorrected Coagulopathy
(iii) Obesity (obese or short neck)
(iv) Neck distortion (previous tracheostomy, scarring, haematoma, tumor, thyromegaly)
(v) Tracheomalacia
(vi) C-spine immobilisation (cervical fusion, rheumatoid arthritis, cervical instability)
(vii) Infection in the soft tissues of the neck

surgical vs percutaneous tracheostomy

1999 Dulguerov et al Crit Care Medicine
- open vs perc., PDT is heterogeneous group, concl.: (i) Giaglia+Bronch lowest complic among PDT, (ii) PDT lower post-op but higher periop complication

2000 Cheng et al Ann Otol Rhinol Laryngol open vs PDT, incl. 4 RCTs, concl.: (i) PDT lower risk of bleeding and infection, (ii) PDT+Bronch as safe as open tracheostomy

2000 Freeman et al Chest open vs PDT, ICU patients, Indication prolonged ventilation, well defined inclusion/exclusion criteria, incl SRCTs (236 pat.), concl.: (i) no overall difference in mortality rate, (ii) advantages of PDT shorter duration (9 mins), (iii) lower overall postop complications, (iv) lower bleeding rate

2006 Delaney et al Crit Care Med
- PDT vs open, extensive search, validity assessment for RCTs, - inclusion/exclusion criteria well defined, largest metaanalysis, 17 studies, 1212 pat., concl.: (i) PDT lower wound infection, (ii) no difference in bleeding and complication rates, (iii) PDT seems to be the choice for an elective ICU tracheostomy

2007 Higgins et al Laryngoscope
- PDT vs open, 15 studies (873 pat.), well defined incl/excl criteria, concl.: (i) PDT higher risk of accidental decanulation, (ii) lower risk of infection or unfavorable scarring, (iii) trend towards lower overall complication rate (OR=0.75, CI=0.56-1.0), (iv) no difference in reg of bleeding, subglottic stenosis, death; (v) PDT is faster (4.6 mins); (vi) PDT is cheaper (456 USD/pat), (vii) low conversion rate (7.7%)

patient selection

The ideal patient:
(i) Haemodynamically "stable"
(ii) FiO₂ < 0.6
(iii) PEEP < 10
(iv) Uncomplicated endotracheal intubation
(v) Lean patient with supple neck and prominent cervical landmarks (Palpable cricoid cartilage > 3 cm above sternal notch)

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removal

- removal can be considered when:
  (i) there is an absence of upper airway obstruction (eg tracheal stenosis or granulation tissue)
  (ii) suctioning is becoming less frequent (2-4 hourly)
  (iii) the patient is co-operative & has a good cough
  (iv) the patient can protect their upper airway from aspiration
  (v) the oxygen requirement has decreased and the patient does not require invasive ventilation

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