Airway complications on the general medical unit after prolonged ICU admission

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Tracheostomies

Introduction

Background

Uses and disadvantages

Techniques

Issues on the ward

Decanulation
Three facts that may shock you:
Movie

Three facts that may shock you:

• That was not filmed at the Royal Adelaide Hospital ICU
Movie

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• That was not filmed at the Royal Adelaide Hospital ICU
• Whiskey out of a flask is not used to sterilise equipment
Three facts that may shock you:

• That was not filmed at the Royal Adelaide Hospital ICU
• Whiskey out of a flask is not used to sterilise equipment
• Biros are not used as tracheostomy tubes
Introduction

Advances in intensive care $\rightarrow$ increased patient survival in those who would have otherwise succumbed

Those requiring prolonged mechanical ventilation $\rightarrow$ tracheostomy
What is a tracheostomy?
What is a tracheostomy?

An airway that is inserted (subglottically) through neck tissues directly into the trachea.
Types

Emergency (Crico-thyroid)
- Percutaneous (Needle)
- Surgical

Elective (Tracheal rings)
- Percutaneous
- Surgical
Tracheostomy tubes

Outer tube

Inner tube – fits snugly into outer tube

Flange – flat plastic plate allows the tube to be secured

Connector

Obturator

Tracheostomies

Introduction

Background

Uses and disadvantages

Techniques

Issues on the ward

Decanulation
Tracheostomies

Introduction ✔

Background

Uses and disadvantages

Techniques

Issues on the ward

Decanulation
Background

3600 BC – Seen on Egyptian tablets

2000 BC – Sacred hindu texts (“Rigveda”)

400 BC – Hippocrates – condemned the practice → unacceptable risk of carotid artery damage

Sitting et al. AARC Times (2001)
Antonio Musa Brassavola

1546 – Performed the first documented successful tracheostomy

• Patient with laryngeal abscess

Goodall EW. British Journal of Children’s Diseases (1934)
Friedrich Trendelenburg

- 1869 – First proposed the use of a cuffed tracheostomy tube

Lomholt N. Acta Anaesthesiologica Scandanavia (1967)
Chevalier Jackson

- 1909 – Described the current used surgical technique
- Emphasised post operative care

Introduction ✔

Background

Uses and disadvantages

Techniques

Issues on the ward

Decanulation
Tracheostomies

Introduction ✔
Background ✔
Uses and disadvantages
Techniques
Issues on the ward
Decanulation
Uses

Mechanical ventilation is expected to be prolonged
Mechanical ventilation is expected to be prolonged

- Comfort/reduced sedation
- Decreases work of breathing
- Weaning off ventilator
- Communication

- Nursing care (mouth care and mobility)
- Ease of replacement of tracheal tube
- Facilitate transfer to the ward
Disadvantages

Needs a surgical procedure

• Inherent risks of invasive procedure
Disadvantages

Needs a surgical procedure

• Inherent risks of invasive procedure

<table>
<thead>
<tr>
<th>Early</th>
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<tbody>
<tr>
<td>Bleeding, pneumothorax, surgical emphysema, malposition, damage to local structures, death</td>
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<table>
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<th>Delayed</th>
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<td>Infection, obstruction, ulceration, dysphagia, decanulation issues</td>
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<td>Stenosis, granuloma, persistent sinus, tracheomalacia</td>
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Disadvantages

Needs a surgical procedure
  • Inherent risks of invasive procedure

Issues with speech/swallowing

Looks

Living with tracheostomy

- Early
  - Bleeding, pneumothorax, surgical emphysema, malposition, damage to local structures, death

- Delayed
  - Infection, obstruction, ulceration, dysphagia, decanulation issues

- Late
  - Stenosis, granuloma, persistent sinus, tracheomalacia
Tracheostomies

Introduction ✔
Background ✔
Uses and disadvantages
Techniques
Issues on the ward
Decanulation
Tracheostomies

Introduction ✔

Background ✔

Uses and disadvantages ✔

Techniques

Issues on the ward

Decanulation
Tracheostomies

Introduction ✔
Background ✔
Uses and disadvantages ✔
Techniques
Issues on the ward
Decanulation
Techniques

Emergency

- Percutaneous (Needle)
- Surgical

Elective

- Percutaneous
- Surgical
Emergency

Surgical
Emergency

Surgical

Percutaneous (Needle)
Emergency

Surgical

Percutaneous (Needle)

- Oxygenation
- Transtracheal Jet Ventilation

Patel R. Chest (1999)
Elective

Surgical – surgical dissection down to trachea with insertion of tracheostomy tube for ventilation
Elective

Surgical – surgical dissection down to trachea with insertion of tracheostomy tube for ventilation

Percutaneous – different techniques to insert a tracheostomy
  • Gradual dilatation
  • Forceps dilatation
<table>
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<tr>
<th>Surgical:</th>
<th>Percutaneous:</th>
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<tbody>
<tr>
<td>Under direct vision</td>
<td>Less bleeding</td>
</tr>
<tr>
<td>Better for difficult cases</td>
<td>Quicker and cheaper</td>
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<tr>
<td>Avoid aberrant vessels</td>
<td>Can be done in the ICU</td>
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<tr>
<td></td>
<td>Can be performed sooner</td>
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</table>
Tracheostomy
Tracheostomies

Introduction ✔

Background ✔

Uses and disadvantages ✔

Techniques

Issues on the ward

Decanulation
Tracheostomies

Introduction ✔
Background ✔
Uses and disadvantages ✔
Techniques ✔
Issues on the ward
Decanulation
Issues on the ward

Respiratory distress

• Blocked/displaced tube

Bleeding
Respiratory distress
Respiratory distress

Tracheostomy tube

- Blocked/displaced?
Respiratory distress

Tracheostomy tube

• Blocked/displaced?
  • Needs removal or replacement
  • Can you pass a catheter
Respiratory distress

Tracheostomy tube

• Blocked/displaced?
  • Needs removal or replacement
  • Can you pass a catheter
• Cuffed/uncuffed
Respiratory distress

Tracheostomy tube

• Blocked/displaced?
  • Needs removal or replacement
  • Can you pass a catheter

• Cuffed/uncuffed
  • Need a cuff for positive pressure ventilation
  • Look for a pilot balloon
Cuffed/uncuffed tube

Respiratory distress

Tracheostomy tube

• Inner tube to be inserted? – ensure it fits

• When was tracheostomy performed?
  • Safe to reinsert tracheostomy tube if >7 days

• Intubate?
  • Laryngectomy or supraglottic pathology intubation not possible
Approach

ABCs

Breathing at mouth/tracheostomy

CPR if indicated

High flow oxygen to mouth/nose/stoma

Check if tracheostomy tube is patent

Look for other causes
Blocked/displaced tube

Remove tube

Oxygenation/ventilation

• Mouth
• Stoma

Consider

• Endotracheal intubation
• Intubation of stoma – airway adjuncts + small tube (size 6.0)
Issues on the ward

Respiratory distress
  • Blocked/displaced tube

Bleeding
Issues on the ward

Respiratory distress ✓

• Blocked/displaced tube ✓

Bleeding
Bleeding
Bleeding

Early (peri-operative) bleeding

• More common
• Usually benign

Late bleeding

• Potentially life threatening
Causes

Specific to tracheostomy

Early (peri-operative) bleeding
- Suction/Manipulation

Late bleeding
- Granulation tissue
- Infection
- Tracheo-innominate fistula
Tracheo-innominate fistula
Tracheo-innominate fistula
Tracheo-innominate fistula

Pressure necrosis of anterior tracheal wall from tube causing erosion of trachea and innominate artery (brachiocephalic trunk)

- Incidence <1%
- Survival 15%
- Mortality is 100% without surgical intervention
- 75% develop within 3 weeks after tracheostomy
Brachiocephalic trunk

- First branch of the aorta
- Traverses trachea at 8-10\textsuperscript{th} ring
- Anatomical variants exist

*Grant et al. British Journal of Anaesthesia (2006)*
Contributing factors
a. Trachea erosion into BCT
b. Abnormally high BCT
c. Low positioned tracheostomy

Jones et al. Annuls of Surgery (1976)
Contributing factors

Cuff overinflation
Local infection
Excessive manipulation of tracheostomy
Long term ventilation
Radiation therapy
Steroids
Diagnosis

Early diagnosis is KEY!

Warning signs

• Sentinel bleed (small bleed in preceding hours)
• Pulsating tracheostomy tube

Imaging – scope, CT angiogram, angiogram
Initial management

Cuff overinflation

Oral ETT distal to site

Digital compression
  - Pre tracheal space
  - Trachea against sternum

Take to theatre

Jones et al. Annuls of Surgery (1976)
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Take to theatre

Approach

ABCs and call for help

Clear airway – clots may need suctioning

Consider ➔ finger pressure/cuff hyperinflation

Correct coagulopathy and replace blood products

Urgent surgical referral

Consider palliation – situation may be fatal

If it settles – investigate other causes
Issues on the ward

Respiratory distress ✔

• Blocked/displaced tube ✔

Bleeding
Issues on the ward

Respiratory distress ✔

• Blocked/displaced tube ✔

Bleeding ✔
Tracheostomies

Introduction ✔

Background ✔

Uses and disadvantages ✔

Techniques ✔

Issues on the ward

Decanulation
Tracheostomies

Introduction ✔

Background ✔

Uses and disadvantages ✔

Techniques ✔

Issues on the ward ✔

Decanulation
Decanulation
Decanulation

Weaning

- Direct removal
- Routine downsizing
- Changing to a cuffless tube
- Capping/corking tube

→ Specific to clinician and institution
Decanulation

Mechanical ventilation is no longer required

Adequate cough

Secretions are minimal – ability to clear

Upper airway obstruction is absent

Co-operative patient
Post decanulation

Tracheal stenosis – usually between stoma and cords
- Symptomatic or asymptomatic $\rightarrow$ 3-12% require intervention
- Worsening dyspnoa, stridor, etc

Tracheomalacia – weakened tracheal wall $\rightarrow$ airway collapse
- Symptoms range from dyspnoea to failure to wean

Epstien S. Respiratory Care (2005)
Post decanulation

Tracheo-oesophageal fistula

- Dyspnoea, pneumonia, recurrent aspiration, gastric distension

Tracheo-innominate fistula

Aspiration

Epstien S. Respiratory Care (2005)
Tracheostomies

Introduction ✓
Background ✓
Uses and disadvantages ✓
Techniques ✓
Issues on the ward ✓
Decanulation
Tracheostomies

Introduction ✔

Background ✔

Uses and disadvantages ✔

Techniques ✔

Issues on the ward ✔

Decanulation ✔
In the news
Doctor performs emergency tracheotomy with a PEN to save woman's life after she choked on a piece of steak in packed restaurant

By RACHEL QUIGLEY

PUBLISHED: 22:43 EST, 25 September 2013 | UPDATED: 07:30 EST, 26 September 2013
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In the news

Pauline Larwood
Key points

- Tracheostomy is a subglottic airway inserted through neck directly into the trachea
- Two broad groups (emergency and elective) – ward patients will have elective airways
  - Two main techniques for each type ➔ percutaneous and surgical
Key points

• Respiratory distress and bleeding - main issues on the ward
  • ABCs – recognise issues specific to tracheostomy tubes (occlusion, fistulas, etc) and treat if possible
  • It takes 7 days for a tract to form
  • Cuffed or uncuffed tubes
  • Watch out for SENTINEL BLEEDS
• Recognise late post tracheostomy complications
The End
With thanks to:
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