



The Capnogram + The Coroner's Report

NO TRACE = WRONG PLACE

CORE TOPICS Aberdeen 2020
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Aberdeen Anaesthesia

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Overview

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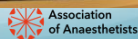
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Capnography Quiz



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Capnography in Cardiac Arrest

- ALS guidelines now recommend capnography during CPR
 - Monitor tracheal tube placement
 - Monitor quality of CPR
- **NO TRACE = WRONG PLACE**
- A capnograph trace **IS STILL SEEN** in cardiac arrest
 - Likely an attenuated waveform
- A **FLAT** trace = **oesophageal intubation** (until proven otherwise)

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Resuscitation Council (UK)

NAP 4 - oesophageal intubation

9 cases (5%)

- 3 Anaesthesia: 2 deaths
- 4 ICU: 2 deaths
- 2 ED: 2 deaths

6 deaths

1 brain damage

2 prolonged ICU stays



A NAP 4 case

"A healthy middle aged patient for elective minor surgery who was known to be atopic was anaesthetised by a locum consultant using induction with fentanyl and propofol. Facemask ventilation was impossible and was followed by hypoventilation. **NAP 4 Learning Point** Training emphasis on interpretation of abnormal laryngeal capnography trace – a flat capnography trace should be taken to mean absence of end-tidal ventilation (tracheal tube misplaced or bronchus obstructed),..... output was restored but the capnograph trace remained flat. The patient was reintubated using a bougie and McCoy blade and transferred to ICU. The patient sustained a significant brain injury."

More Recently....

Two recent patient deaths associated with oesophageal intubation have been highlighted in Coroner's Reports.

- Mrs Sharon Grierson
- Mr Peter Saint

Publicly available on the judiciary website
www.judiciary.uk

Coroners Report – Sharon Grierson

Investigation Findings and Inquest

44 year old female for elective laryngoscopy and removal of polyp from vocal cords on 11th November 2016

- Uneventful procedure, extubated whilst under GA
- During extubation, developed laryngospasm
- Muscle relaxant re-administered and re-intubated
- She had a cardiac arrest, assistance had already arrived (4 consultant anaesthetists + 2 other doctors + trained theatre staff)
- End tidal capnography showed absence of CO₂
- Whilst inserting oro-gastric tube, ETT found in oesophagus, removed and replaced
- Capnography continued to show abnormal readings
- Position of ETT checked by bronchoscopy and again found in oesophagus, then re-sited

Coroners Report – Sharon Grierson

Circumstances

- Clinicians had not appreciated there had twice been oesophageal intubation despite capnography readings (lasting about an hour)
- She died 3 days later

Inquest Conclusion (23/01/2018)

1a Global ischaemic/hypoxic brain injury

1b Unrecognised oesophageal intubation following extubation after operation to remove benign vocal cord polyp

"Died following surgery as a result of being deprived of oxygen due to ETTs being incorrectly placed on two consecutive occasions. ***This death could have been avoided.***"

Coroner's Concerns

- There was a lack of appreciation of what the capnograph was indicating and some lack of understanding of the trace one might expect to see during CPR
- There was a lack of co-ordination and situational awareness
- It became apparent that senior staff often have little experience of crisis situations and there is a danger that they become "de-skilled" to some extent as a result

Actions to be taken

- **The Trust** – all relevant staff are provided with training in simulation suites as "protected time"
- **Nationally** – centres of excellence should provide models, mentoring and support so good practice is disseminated

Coroner's Report – Peter Saint

Investigation Findings and Inquest

71 year old male for elective TKR on 23rd June 2016

- 15:00 - GA undertaken
- 15:40-45 minutes progressive fall in O2 sats, increase in ventilation pressure. Removal of LMA revealed gastric fluid; managed by head down tilt, suction, iGel airway
- 16:00 ETT inserted, however accidental oesophageal intubation unidentified by 3 anaesthetists (2 consultants). Absence of CO2 end tidal wave and "timpanic" abdominal distension (expressed by ODP)
- 16:04 cardiac arrest- CPR commenced.
- 16:25 oesophageal placement of ET confirmed, ET tube relocated to the trachea

Coroner Report – Peter Saint

Circumstances

- Approx 38 minutes of no effective lung ventilation
 - 25 minutes ET incorrectly located in oesophagus
- Confirmation of no effective lung ventilation on CO2 monitor
 - Absence of any end tidal CO2 waveform
 - Digital read of "zero"
- Transferred to ICU where he died 5 days later

Inquest Conclusion (23/10/2017)

1a Hypoxic/ischaemic brain damage following oesophageal placement of ETT

1b General anaesthesia for knee replacement surgery

Coroner's Concerns

Continuing failure to ensure capnography is understood and utilised

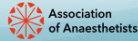
- Lead anaesthetist admitted a "misunderstanding of physiology"

NAP 4 Learning Point...

"Training of all clinical staff who may intubate patients should include interpretation of capnography. Teaching should include recognition of the abnormal (but not flat) capnography trace during low cardiac output states and during CPR."
for anaesthetists

- Particularly in relation to issues of "task fixation" and "confirmatory bias"

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Continued Learning

The Capnograph During CPR

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Capnogram during cardiac arrest
is an attenuated trace
IT IS NOT A FLAT TRACE

This is 5 mins after CPR was stopped



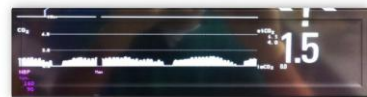
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Capnogram during cardiac arrest
and CPR is an attenuated trace
IT IS NOT A FLAT TRACE

This is during CPR




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Capnogram during
oesophageal intubation
IS A FLAT TRACE



**This is oesophageal intubation
until proven otherwise.
ACT NOW**

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Actions

Assume oesophageal intubation has occurred until proven otherwise

- Remove the tube
- Re-attempt (in most circumstances)
- Use other means
- Exclude blocked tube or circuit as necessary

NO TRACE = WRONG PLACE

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What are the underlying themes
with all cases?

- Lack of appreciation of what the capnography was indicating (particularly trace recognition during CPR)
- Lack of coordination and situational awareness
- Staff may become “de-skilled” at managing crisis situations due to lack of ongoing regular training

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Anaesthetic Lead Group
Response

Capnography

- Highlighting this issue via the Patient Safety Update (SALG), a “Safety Matters” article in Anaesthesia News (AAGBI) and in the DAS newsletter
- Highlighting to RCOA and DAS airway leads
- E-Learning to highlight capnography during CPR

Human Factors

- RCOA Simulation Working Group to provide guidance to departments for regular crisis simulation
- Collaboration with AAGBI and DAS for promoting regular crisis simulation and human factors training

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Actions for Airway Leads

Share this information with

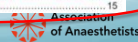
- ALL anaesthetists
- ALL intensivists
- ALL emergency physicians
- Paediatricians who intubate
- Cardiac arrest teams
- Pre-hospital teams
- Advanced paramedic practitioners
- Whole surgical teams



NHS England, NHS Trust & DoH Response

Surgical	4
1. Wrong site surgery	4
2. Wrong implant/prosthesis	5
3. Retained foreign object post procedure	6
Medication	
4. Mis-selection of a strong potassium solution	
5. Administration of medication by the wrong route	
6. Overdose of insulin due to abbreviations or incorrect	
7. Overdose of methotrexate for non-cancer treatment	
8. Mis-selection of high strength midazolam during	
Mental health	
9. Failure to install functional collapsible shower or	
General	
10. Falls from poorly restricted windows	
11. Chest or neck entrapment in bed rails	
12. Transfusion or transplantation of ABO-incompatible	
organs	
13. Misplaced naso- or oro-gastric tubes	
14. Scalding of patients	14
15. Unintentional connection of a patient requiring oxygen to an air	15
16. Undetected oesophageal intubation Temporarily suspended as a Never	15
Event	15

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Summary

Flat Trace - CO₂ capnography
until PROVED otherwise



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Summary



NO TRACE = WRONG PLACE

Let everyone know!



