MALIGNANT HYPERTERMIA

MODULE: CRITICAL INCIDENTS

TARGET: ALL ANAESTHETISTS

BACKGROUND:
All anaesthetists are expected to be able to recognise the features of this life-threatening condition, institute management for its treatment and its potential sequelae. Recent AAGBI guidelines highlight effective teamwork and specific task allocation as fundamental aspects of the treatment of malignant hyperthermia.

RELEVANT AREAS OF THE ANAESTHETIC CURRICULUM

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INFORMATION FOR FACULTY

LEARNING OBJECTIVES:

• Recognition of the signs of malignant hyperthermia under general anaesthesia
• Initial management of malignant hyperthermia, including administration of dantrolene
• Recognition and management of the metabolic sequelae

SCENE INFORMATION:

• Location: Theatre

Mrs Diane Leen is a 26 year old woman who has been induced for a breast operation; a wide local excision. She is currently self ventilating via a laryngeal mask airway under general anaesthesia with Sevoflurane maintenance. The anaesthetics trainee has been called in to take over the case as the consultant anaesthetist needs to go and pre-op the next patient.

EQUIPMENT & CONSUMABLES

<table>
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<tr>
<th>Equipment &amp; Consumables</th>
<th>Persons Required</th>
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<tr>
<td>Manikin – on theatre trolley.</td>
<td>Anaesthetic Junior Trainee</td>
</tr>
<tr>
<td>LMA in situ – Spontaneous ventilation</td>
<td>Anaesthetic Assistant</td>
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<tr>
<td>Checked anaesthetic machine</td>
<td>Anaesthetic Senior Trainee</td>
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<tr>
<td>Stocked Airway trolley</td>
<td>Surgeon</td>
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<tr>
<td>- Laryngoscopes (2 x Macintosh)</td>
<td>Scrub Nurse</td>
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<tr>
<td>- ET Tubes (Various Sizes)</td>
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<tr>
<td>- OP, NP and Advanced Supraglottic airways (iGels, LMAs)</td>
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<tr>
<td>50ml syringes for propofol infusion</td>
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<tr>
<td>Theatre drapes</td>
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<tr>
<td>Dantrolene</td>
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<td>Cold IV Fluids</td>
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<td>Ice</td>
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VOICE OF ‘TELEPHONE HELP BRIEFING’

Inform the team of the presence of the AAGBI guidelines within the sim suite (if available).
Ensure the team know where the dantrolene is in the sim suite.
Provide additional team members at intervals through this scenario if required.
EXPECTED ACTIONS:
• Consider differential diagnosis
• Treat for MH
• Call for help.
• Inform surgical team of problem and expedite end of operation.
• 100% oxygen
• Control ventilation to hyperventilate – use non-depolarising muscle relaxant
• Stop volatile, change circuit, change or flush anaesthetic machine.
• Continue anaesthesia with propofol (TIVA)
• Send for dantrolene.
• Commence active cooling measures.
• Send blood for ABG, FBC, Coags, Biochem, CK, Urine for myoglobin, Group & Save.
• Surgeons to catheterise patient, and commence cold bladder irrigation

INITIAL SETTINGS
A: LMA in situ
B: RR 10/min spont ventilation, SaO2 99%, FiO2 35%, et CO2 4.5
C: HR 80bpm, 94/50
D: Eyes closed, pupils equal.
E: Fully monitored, Surgical drapes on, GA maintained with sevoflurane. Temp 36.8

DEVELOPING MH
A: LMA in situ.
B: etCO2 8.5 over 5 mins. RR 25 over 5 mins.
C: HR 115 over 5 mins, 88/50
D: Eyes closed, pupils equal.
E: Temp 37.5

EXPECTED ACTIONS
• Allocate specific tasks as help arrives (as per AAGBI guidelines)
• Administer dantrolene 2.5mg/kg initial then 1mg/kg every 10-15mins.
• Identify and treat complications: Hyperkalaemia, arrhythmias, acidosis, DIC

RESULTS
• 1st ABG (on 100% O2):
  o pH 7.12
  o pO2 15
  o pCO2 10.4
  o BE -14.5
  o lac 7.1
  o Hb 11.5
  o K 9.2
  o Gluc 6.3
• Initial bloods:
  o Hb 11.2
  o WCC 14
  o Plt 90
  o INR 1.3
  o APTR 1.5
  o Na 138
  o K 7.5
  o Urea 5
  o Creat 80
• 2nd ABG (on 100% O2) (after hyperkalaemia treated):
  o pH 7.04
  o pO2 9.2
  o pCO2 9.0
  o BE -12.6
  o lac 8.1
  o Hb 10.2
  o K 7.6

HYPERTERMIA
A: LMA in situ
B: etCO2 12 over 5 mins unless ventilation controlled, otherwise remains at 8.5. RR as per ventilator settings.
C: HR 125, 75/40
D: Eyes closed, pupils equal.

EXPECTED ACTIONS
• Physiological parameters stabilise with appropriate treatment.
• Make provision to transfer to ICU post op.

REDUCED DIFFICULTY
• Tachycardia and temperature continue to increase, etCO2 stabilises.
• Hyperkalaemia requires treatment.

EXPECTED DIFFICULTY
• Refractory hyperkalaemia leads to arrhythmias – SVTs and pulsed VT alternately – Mg, metoprolol and amiodarone available. DC cardioversion successful if used.
• Theatre team report dark urine – need for forced alkaline diuresis.

INCREASED DIFFICULTY
• Transfer to ICU when patient stabilised.

TRANSFER TO ICU WHEN PATIENT STABILISED.

CONDUCT OF SCENARIO
**PATIENT DETAILS / ADDRESSOGRAPH**

**Hospital No:**

**SURNAME:** Diane Lean

**(Block Letters)**

**FORENAMES:**

26 years old

**Address:**

**Ward/Hosp:**

**DOB:**

**Sex:** M / F

**Procedure(s) proposed:**

Wide local excision of Lt breast

**CEP/D/O CLASS:** ELECTIVE / SCHEDULED / URGENT / EMERGENCY

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### Anaesthetist's preoperative assessment by

**Name:**

**Date:**

**Time:**

**Grade:**

- Cons
- AS
- SG
- Trainee

**Signature:**

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### Anaes / Surg history:

Previous childhood GA - uneventful

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### Medical history:

Nil

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### Airway Assessment

**Mouth Opening:**

**MP Score:** 1 2 3 4

**Jaw:** MP1. Good neck and jaw

**Neck:** ROM

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### TEETH

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### Relevant Medication:

2200 yesterday

**Neg**

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### ALLERGIES

Nil Known

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### Investigations

- **Haematology**
  - FBC
  - NAD

- **Biochemistry**
  - U & E

- **Coag.**
  - NAD
  - Blood Sugar:
  - Gp. & Save NAD
  - X - Match

- **ECG**
  - X - Ray

- **GA**
  - Sedation
  - Epidural

- **Spinal**
  - Regional

- **Suppository**
  - NAD
  - PCA
  - EPCA

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**Notes / Discussion / Technique proposed:**

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**For attention or ward staff:** (turner investigations, testing, continue/omit current medication, etc.)
INFORMATION FOR PARTICIPANTS

KEY POINTS:

- Recognition of the signs of malignant hyperthermia under general anaesthesia
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WORKPLACE-BASED ASSESSMENTS

Basic Competences for Critical Incidents – Demonstrates the emergency management of the following critical incidents in simulation:

1. Rise in end tidal CO2
2. Unexpected hypotension
3. Sinus Tachycardia
4. Arrhythmias [ST segment changes; sudden tachydysrhythmia; sudden bradycardia; Ventricular Ectopics – Ventricular tachycardia – Ventricular Fibrillation]

Demonstrate the management of the following specific conditions in simulation:

1. Malignant hyperpyrexia

FURTHER RESOURCES

   Malignant Hyperthermia Crisis laminate
   Malignant Hyperthermia Crisis recommended contents

2. AnaesthesiaUK Malignant Hyperthermia Resource
   http://www.frca.co.uk/sectioncontents.aspx?sectionid=83
PARTICIPANT REFLECTION:

What have you learnt from this experience? (Please try to list 3 things)

How will your practice now change?

What other actions will you now take to meet any identified learning needs?
PARTICIPANT FEEDBACK

Date of training session: ...........................................................................................................................................

Profession and grade: ..............................................................................................................................................

What role(s) did you play in the scenario? (Please tick)

- Primary/Initial Participant
- Secondary Participant (e.g. ‘Call for Help’ responder)
- Other health care professional (e.g. nurse/ODP)
- Other role (please specify):
- Observer

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<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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| I found this scenario useful 
| I understand more about the scenario subject 
| I have more confidence to deal with this scenario 
| The material covered was relevant to me |

Please write down one thing you have learned today, and that you will use in your clinical practice.

How could this scenario be improved for future participants?  
(This is especially important if you have ticked anything in the disagree/strongly disagree box)
FACULTY DEBRIEF – TO BE COMPLETED BY FACULTY TEAM

What went particularly well during this scenario?

What did not go well, or as well as planned?

Why didn’t it go well?

How could the scenario be improved for future participants?