3-8 Malignant hyperthermia crisis v.2

Unexplained increase in $ETCO_2$ AND tachycardia AND increased oxygen consumption. Temperature rise is a late sign.
MH is rare. Always consider other, more common causes of hyperthermia (see 2-8 Peri-operative hyperthermia).

START

1. Call for help and inform theatre team of problem, note the time.
2. Aim to abandon or finish surgery as soon as possible.
3. Call for MH treatment pack/dantrolene and cardiac arrest trolley.
4. Maintain anaesthesia with TIVA, neuromuscular block with non-depolarising drug.
5. *Allocate enough team members to perform* 6, 7 *and* 8 *simultaneously:*
   6. **Eliminate trigger drug (Box A).**
   7. **Give dantrolene (Box B).**
   8. **Begin active body cooling (Box C)**
9. Additional monitoring: invasive BP, CVP, core and peripheral temp, urine output
10. Send urgent samples for arterial blood gases, U&E, glucose, FBC, coagulation, urinary pH, creatine kinase (peak 12-24h) and repeat as indicated.
11. Seek and treat complications (Box D).
12. Continue ventilation and plan admission to critical care. Further dantrolene may be needed. (Ensure plan exists to counsel patient and family and refer Leeds MH Unit)

EMERGENCY HELP

Emergency hotline 07947 609601 or 0113 243 3144

UK MH Registry website: www.ukmhr.ac.uk

Box A: ELIMINATE TRIGGER DRUG

- Turn off vaporisers and remove from anaesthesia workstation
- Set fresh gas flow to 100% oxygen, maximum flow
- Hyperventilate (2-3 x normal minute ventilation)
- Place activated charcoal filters on both limbs of the breathing circuit
- Change soda lime and breathing circuit if/when feasible (not a priority)

Box B: DANTROLENE

- Delegate mixing – it is time and labour intensive
- 2-3 $mg.kg^{-1}$ immediate i.v. bolus (Adult approx. 200 mg)
- Repeat 1 $mg.kg^{-1}$ every 5 mins, until $ETCO_2$ <6 kPa and temp <38.5C
- Pause and observe
- Repeat 1 $mg.kg^{-1}$ to maintain $ETCO_2$ <6 kPa and temp <38.5C, even if exceeds 'maximum' dose 10 $mg.kg^{-1}$

Box C: ACTIVE COOLING

- Turn off active warming
- Apply ice to axillae and groins
- Use cold i.v. fluids
- Consider cold peritoneal lavage
- Other cooling methods according to need and availability: surface cooling devices, intravascular devices, extracorporeal heat exchange

Box D: COMPLICATIONS AND OUTLINE TREATMENTS

Metabolic acidosis: Sodium bicarbonate 50 mmol (50 mL of 8.4% solution) if pH <7.2 despite hyperventilation
Hyperkalaemia: Sodium bicarbonate 50 mmol (50 mL of 8.4% solution); Glucose (50 mL of 50%) with insulin 10 IU; Calcium 0.1 $mmol.kg^{-1}$ (in extremis)
Myoglobinuria: Forced alkaline diuresis (aim UOP >2$mL.kg^{-1}$; urine pH >7)
DIC: FFP, cryoprecipitate, platelets
Tachyarrhythmias: Amiodarone, β-blockers
Compartment syndrome: surgical decompression
AVOID Calcium channel blockers (interaction with dantrolene)