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MANAGEMENT OF CRISES DURING ANESTHESIA AND SURGERY. PART XI: PULMONARY EDEMA & WATER INTOXICATION.

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PULMONARY OEDEMA/ARDS

Pulmonary edema is a potential cause of hypoxia in the perioperative patient. The accumulation of excessive alveolar fluid results in hypoxia due to interference with diffusion across the alveolar capillary membrane. Frothy (sometimes blood-stained) sputum may be expectorated or observed in the endotracheal tube. the abnormal accumulation of fluid in the interstitial or alveolar spaces of the lung can be explained on the basis of a disturbance in the normal Starling equation[1]. It involves changes in hydrostatic or oncotic pressure across the alveolar membrane or in the permeability of the alveolar membrane such that fluid moves across from the capillaries into the alveolar space.

SIGNS[1]

Respiratory distress/tachypnoea
Desaturation
Increased inspiratory pressure
Pink frothing sputum up ETT, LMA (diagnostic)
Crepitations or bronchospasm

PRECIPITATING FACTORS

Fluid overload[2]
Non cardiogenic:
- Post airway obstruction[3]
- Anaphylaxis
- Neurogenic
- Sepsis
- Pulmonary aspiration
- Multiple organ failure

Cardiogenic[4]

EMERGENCY MANAGEMENT

Titrate inspired oxygen concentration against SpO2
Head up tilt/sit up
If self ventilating/apply CPAP[5]
Intubate if necessary
IPPV and PEEP if intubated
Consider drug therapy: morphine/GTN/frusemide[6]

FURTHER CARE

Consider and investigate likely cause
Review perioperative fluid balance/renal function
Non-cardiogenic: consider post airway obstruction
- Allergy/anaphylaxis
- Aspiration
- Sepsis
- Multiple organ failure, eg major trauma, pancreatitis
- Renal - renal function tests

Cardiogenic:
- ECG
- Cardiac enzymes
- Echocardiogram
- Chest X-ray

Consider admission to high dependency area/ICU

Notes:

Success in the management of the initial physiological upset is essential, however it was considered that the use of this specific sub-algorithm would be required once the initial diagnosis of pulmonary oedema was made[4-7]:

(1) Hypoxia, pink frothy sputum, increased airway pressures, respiratory distress, crepitations or wheeze.

(2) Fluid overload was judged to be the cause in half of incidents.
Most of these had pre-existing conditions making them more susceptible to overhydration: age >70, cardiovascular disease or hypertension, renal failure and chronic airflow limitation.

(3) few of incidents were judged to be post upper airway obstruction. Some were judged to be cardiogenic in origin, eg. valvular heart disease, ischemia/infarction, cardiac failure, arrhythmia. CPAP is important specific therapy for pulmonary edema (in addition to treatment for hypoxia).

(4) Preload reduction:
Morphine 1 mg IV doses,
GTN infusion 50 mg in 500 ml, begin with 0.1 ml/kg/hr

Fluid reduction:
Frusemide 0.5 mg/kg IV if fluid overload (place urinary catheter)

If hypotensive:
Adrenaline infusion: start with 0.00015 mg/kg/min
Adrenaline: for easy adult dosing, Titrate against heart rate and blood pressure

References

1. Bersten AD, Soni N, Oh TE. Oh's Intensive Care Manual, 5th ed. Edin. Butterworth-Heinemann, 2003.
2. Koh MS, Hsu AA, Eng P. Negative pressure pulmonary oedema in the medical intensive care unit. Intensive Care Med 2003;29:1601–4.
3. Patton WC, Baker CL. Prevalence of negative-pressure pulmonary edema at an orthopaedic hospital. J South Orthop Assoc 2000;9:248–53.
4. Quader K, Manninen PH, Lai JK. Pulmonary edema in the neuroradiology suite: a diagnostic dilemma. Can J Anaesth 2001;48:308–12.
5. Pandey CK, Mathur N, Singh N, et al. Fulminant pulmonary edema after intramuscular ketamine. Can J Anaesth 2000;47:894–6.
6. Runciman WB, Webb RK, Klepper ID. Crisis management: validation of an algorithm by analysis of 2,000 incident reports. Anesth Intensive Care 1993;21:579–92.
7. Pulmonary oedema, MJ Chapman, J A Myburgh, M T Kluger, et al. *Qual Saf Health Care* 2005 14: e8

WATER INTOXICATION

Water intoxication is also known as water poisoning or hyperhydration. Excessive water drinking may results in a drop of blood sodium levels[1]. Drinking as little as 2 liters of water per hour for few successive hours can result in water intoxication[2].

Irrigation of closed spaces of the body may lead to extensive perioperative fluid and electrolyte shifts. The transurethral resection of prostate (TURP) syndrome is characterized by a spectrum of symptoms ranging from asymptomatic hyponatremia, to many symptoms and signs. A similar syndrome has been described in women underwent transcervical endometrial ablation (TCEA)[5,6].

The occurrence of this ‘‘water intoxication’’ syndrome is determined by a combination of surgeon, patient, and factors in the procedure itself.

Asymptomatic hyponatremia can occur in over 50% of TURPs, while clinically detectable TURP syndrome may become obvious in 2% of resections[7]. As the results of this syndrome can be serious, early detection and proper management are vital[8].

Symptoms and signs[3,4,8].

In Awake patient:

Confusion, sedation, drowsiness
Nausea, vomiting
Chest pain
Convulsions
Coma

In anesthetized patient:

Hyponatremia ECG changes
Hypotension or hypertension
Bradycardia
Bronchospasm
Desaturation
Delayed recovery from anesthesia

Precipitating factors and management[8].

Closed cavity irrigation
Prolonged operative time
Administration of large amount of hypotonic fluids

Emergency management:

Inform the surgeon
Stop irrigation and surgery
Increase FiO_2
Monitor blood gases
Urgent infusion of sodium, potassium or blood
Normal saline with Frusemide 0.5-1 mg/kg. IV
Mannitol 0.25 g/kg.
In convulsions, use hypertonic saline and anticonvulsants

Further care:

Continue ECG and SpO_2 monitoring
Maintain fluid balance
Keep monitoring electrolytes, osmolarity, blood gases
Do central venous line or pulmonary artery catheter
Admission to the ICU

Notes[9]

CNS symptoms occur early so should be aware about them
Circulatory overload can be manifested as hypoxia during general anesthesia
ECG monitoring of V5 is important to see the ST segment
Using hypertonic saline rapid correction can cause central pontine myelinolysis
The commonest management strategies reported involved administration of frusemide, normal saline, and IPPV

References

1. D J Farrell and L Bower, Fatal water intoxication. J Clin Pathol. 2003 Oct; 56(10): 803–804.
2. Jan Modric, Water Intoxication (Overdose) Symptoms and Treatment. Ehealthstar, evidence based health articles, November 19, 2013.
3. Jensen V. The TURP syndrome. Can J Anaesth 1991;38:90–6.
4. Hughes PD, McNicol D, Mutton PM. Postoperative hyponatraemic encephalopathy: water intoxication. Aust NZ J Surg 1998;68:165–8.
5. McSwiney M, Myatt J, Hargreaves M. Transcervical endometrial resection syndrome. Anaesthesia 1995;50:254-257.
6. Hwang CB, Hui YL, Liu WC. Absorption of irrigating fluid during transcervical resection of endometrium—a report of two cases. Acta Anaesthesiol Sin 1997;35:45-50.
7. Okeke AA, Lodge R, Hinchliffe A. Ethanol-glycine irrigating fluid for transurethral resection of the prostate in practice. BJU Int 2000;86:43-46.
8. M T Kluger, S M Szekely, R J Singleton. Crisis management during anaesthesia: water intoxication. qshc.bmj.com, 2010, Published by group.bmj.com.
9. Australian Patient Safety Foundation. Crisis Management Manual, 1996, 74pp. Available at http://www.apsf.net.au/anaesthesia.htm, 2004.