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Post Resuscitation Stabilization

วิชัย รุ่งฟ้าแสงอรุณ

ในช่วง 50 ปี ที่ผ่านมาได้มีการพัฒนาการของสิ่งของทางการแพทย์มากมาย ซึ่งทำให้การรักษาและการดูแลผู้ป่วย Critical care เป็นไปอย่างดียิ่ง เช่น :-

1. เครื่องช่วยหายใจ & Technique การใช้ทันสมัยขึ้นซึ่งมี Mode ใหม่ๆ ให้ใช้
2. Prosthetic materials ที่ทันสมัย
3. Intra operative myocardial preservation และ เครื่องปอดหัวใจเทียม
4. การทำผ่าตัดที่มีความประณีตมากขึ้น
5. การทำ Standardization & Routine post operation ใน ICU มีความเป็นมาตรฐานสากล ซึ่งทำให้ผู้ป่วยได้รับการดูแลที่ดีกว่าเดิม และเป็นการลด Morbidity & Mortality จากเดิมมาก

มาตรฐานในการรับผู้ป่วย และขั้นตอนต่างๆ ใน ICU

ได้แก่ การมี Staff Team & Nursing Team เฉพาะทาง การดูแลผู้ป่วย ซึ่งพร้อมจะมีการเปลี่ยนแปลงทาง Hemodynamic โดยอาจไม่มีสัญญาณมาก่อน การดูแลผู้ป่วยให้คงที่ ซึ่งจำเป็นต้องอาศัย

Checklist Hemodynamic Evaluation

Preoperative

- Indications for surgery
- Examination of patient
- Catheterization data
- Medication; associated diseases

Intraoperative

Anesthetic, surgical problems
CPB, AXC time (revascularization, valve replacement)
Weaning from CPB
Arrhythmias
Filling pressures
Inotropic status
Vasoactive drugs
Pulmonary function
Hemostasis
Renal function, fluid, electrolytes

Admission to ICU

Anesthetic depth - need for sedation
Circulatory status
Pulmonary status
Bleeding (wounds, chest tubes)
Urine (volume, nature)
Temperature
Monitoring lines (site, calibration, problems, values)

Routine Hemodynamic Management

1. Routine monitoring ECG, arterial line, CVP Urinary catheter, chest tubes NP/rectal temperature
2. Stabilize
Heart rate and rhythm
3. Aggressive fluid therapy
Restore intravascular volume (HR, BP, CVP, urine, skin perfusion)
Restore hematocrit
4. Vasodilator therapy
Sodium nitroprusside 0.5 - 3.0 $\mu\text{g}/\text{kg}/\text{min}$ (restoration of volume, heat distribution, pressure control, afterload reduction)

5. Inotropic support

Calcium chloride 1 g IV	}	When
Dopamine 3-5 µg/kg/min		Indicated

Monitoring System ซึ่งเป็นระบบ Continuous Alarm system ประกอบด้วย

- Arterial line
- Pressure - measuring line,
- EKG
- CO monitoring
- O₂ sat
- ET CO₂

แนวทางการรักษาผู้ป่วย Arrhythmias

Pathogenesis of Postoperative Arrhythmias

Sinus tachycardia

Sympathetic reflex;

Pain, hypovolemia, anxiety, hypercobia, hypoxemia, low cardiac output, hyperdynamic response

Conduction defects

Residual conduction disease

Cardiopulmonary bypass

Myocardial edema

Cold hyperkalemic cardioplegia

Surgical procedures

AVR, MVR, septal myotomy, reconstruction around A-V node

Drugs

Digitalis, propranolol

Ventricular Arrhythmias

Sympathetic reflex

Pain, hypovolemia

Acid-base imbalance

Acute respiratory alkalosis, acidosis

Electrolyte imbalance

↓ K⁺, ↓ Mg⁺⁺

Myocardial ischemia or hypoxia

Drugs

Sympathomimetics, aminophylline, digitalis, calcium

Supraventricular Arrhythmias

Sympathetic reflex

Pain, hypovolemia

Residual disease

Chronic pulmonary disease (MAT)

Chronic atrial fibrillation

Sick sinus, preexcitation syndromes

Surgical trauma

Atrial edema

Rapid atrial distension/contraction

Hypoxemia (atelectasis)

Drugs

Sympathomimetics, aminophylline, digitalis

Treatment อื่นๆ :-

- pacing units ในผู้ป่วยผ่าตัดหัวใจ 2nd degree (II), 3rd degree
- การให้ infusion pump ซึ่งให้ยา inotropic agents
- สาย Drain ต่างๆ ต้องได้รับการดูแลและจดบันทึก
- Urine out put ดูทุก 15 นาที - 1 ชม.
- การดูแลผู้ป่วยใน ICU ซึ่งมักมี ET tube มาด้วย ซึ่งบางรายต้องใช้ Mechanical Ventilators ใน Mode ต่างๆ ตามความเหมาะสมกับผู้ป่วยแต่ละประเภท, การ weaning ผู้ป่วยจากเครื่อง, การ off ET tube และการเฝ้าสังเกตอาการผู้ป่วยที่ต้องการ O₂ Support

Goals of Postoperative Pulmonary Management

Phase 1 Restoration of functional residual capacity (FRC)

Maintenance of adequate gas exchange in face of rising VO₂ and VCO₂

Phase 2 Ventilatory weaning and extubation

Phase 3 Postextubation respiratory care

Different Strategies Used in Weaning Following Short-Term Ventilatory Support

Strategy	Rationale and Technique
T-piece	* Abrupt reloading of ventilatory muscles, using a brief trial of spontaneous ventilation to demonstrate that the patient can breathe without assistance once predictive variables suggest that it will be successful; the patient is disconnected from the ventilator and a high flow of warmed, humidified, oxygen-enriched air is provided during trial
Intermittent Mandatory Ventilation (IMV)	* Gradual reloading of ventilatory muscles as tolerated by patient until all ventilator volume-targeted technique in which the number of mandatory breaths is progressively decreased, with the adequacy of the patient's efforts assessed by comfort, breathing pattern, and arterial blood gas values; the patient remains connected to the ventilator until weaning is complete
Pressure Support	* Gradual reloading of ventilatory muscles as tolerated by patient until all positive pressure inspiratory assistance is discontinued; a pressure-targeted technique in which the patient is switched to spontaneous breathing with positive pressure inspiratory assist, and the inspiratory pressure level is progressively decreased as tolerated; the patient remains connected to ventilator until weaning is complete

Characteristics of Patients Successfully Treated with Noninvasive Positive Pressure Ventilation

Cooperative patient

Intact neurologic function

Able to coordinate breathing with ventilator

Moderate to moderately high (but not very high) severity of illness

Intact dentition

Able to control oral and pulmonary secretions

Moderate hypercapnia

Moderate respiratory acidosis (pH > 7.20)

Indications for Extubation

1. Reversal of excessive shunting or dead space
 - a. Shunt reduced, FRC restored as evidenced by good AaDO₂
 - b. V_d reduced: No acute bronchospasm or hypercapnia
2. Normal gas exchange on CPAP or T- tube for 1 hour
 - a. pH > 7.35 at f < 28/min
 - b. Maintenance of adequate V_T and V_E without excessive work
3. Ability to maintain FRC after extubation
 - a. CNS status : Alert, cooperative, not narcotized
 - b. Neuromuscular status
 - Adequate hand grip, thoracic excursion
 - FVC > 15 ml/kg (normal 50- 70 ml/kg)
 - MIF > -25 cmH₂O (normal -80 to -100 cmH₂O)

Contraindications to Extubation

1. Residual narcosis or muscle relaxation (avoid reversal agents)
2. Neurologic complications
3. Severe reversible intrapulmonary shunting
4. Unstable hemodynamic status
 - a. Sick mitral → rebound pulmonary edema
 - b. Excessive fluid loading : weight gain > 5 kg
 - c. Persistent requirement for high filling pressures
5. Arrhythmias
 - a. return of atrial fibrillation in chronic fibrillators
 - b. ventricular arrhythmias requiring high-dose antiarrhythmic therapy or repeated cardioversion
6. IABP

Extubation Procedure

1. explain procedure fully to patient and sit upright as much as tolerated; have tissues and emesis basin ready.
2. Through endotracheal suctioning with reexpansion by bag and oxygen after each attempt; suction mouth.
3. Instruct patient to take deep breath and hold it.
4. While cords are open, rapidly deflate cuff and remove endotracheal tube
5. Urge patient to cough with expiration from previous deep breath. Be prepared for large mucus plug (previously lying on cuff in trachea) which you catch with tissue in emesis basin.
6. Place aerosol oxygen mask with f_{iO_2} 0.1 higher than while intubated. Explain goals of postextubation respiratory therapy to patient.

Postextubation Respiratory Therapy

1. Oxygen therapy
 - a. check ABGs 1 hour and 6 hours after extubation, or prn
 - b. Maintain on O_2 continuously for 24 hours
 - c. Thereafter provide O_2 during sleep or supine position, as indicated
 - d. Change to nasal prongs allows O_2 during eating and spirometry
 - e. Check chest film 6 hours after extubation, if indicated, then daily
2. Respiratory therapy and mobilization
 - a. incentive spirometry q 1 h
 - b. aerosol treatments with bronchodilator q4h : Acute bronchospasm, heavy smoking, diffuse rhonchi
 - c. IPPB Treatments with bronchodilator q4h : Patient too weak or too tired to use spirometry or aerosol: severe, acute bronchospasm
 - d. Gentle CPT and positioning for severe atelectasis
 - e. Decannulation and mobilization (dangling, sitting, standing, walking) as soon as possible
 - f. Contraindicated: Cough tubes CPT in Trendelenberf
3. Hemodynamic interactions
 - a. augmented diuresis as indicated (furosemide, dopamine)
 - b. control of arrhythmias (potassium, digoxin, pacing)
 - c. inotropic support, afterload/preload reduction, as indicated

4. Decannulation procedure
 - a. NG tube, urinary catheter removed at extubation
 - b. Peripheral IV, arterial line removed 4-6 hours later if stable (pulmonary artery catheter removed when stable)
 - c. Pleural tubes removed after extubation when drainage < 20ml/hour for 3 consecutive hours (left atrial line removed before pleural tubes)
 - (1) suspected pneumo/hemothorax: Place tubes to underwater seal for 6 hours, check chest film, then remove
 - (2) postoperative bleeding: Leave tubes in place for 24 hours