

### Endotracheal intubation or tracheostomy

For airway protection (e.g. coma)

For suction of secretions

To assist sedation and neuromuscular paralysis (e.g. to ↓  $\dot{V}O_2$ , ↓ respiratory distress)

To overcome upper airway obstruction

### Mechanical ventilation

To manipulate alveolar ventilation ( $V_A$ ) and  $PaCO_2$  (e.g. reverse respiratory acidosis, ↓ cerebral blood flow and ICP)

To ↑  $SaO_2$  and  $PaO_2$  (by ↑ FRC, ↑ end-inspiratory lung volume, ↑  $V_A$ , ↑  $FiO_2$ )

To ↓ work of breathing (e.g. to overcome respiratory muscle fatigue)

To ↑ FRC (e.g. ↑  $PaO_2$ , ↓ VILI)

To stabilize the chest wall in severe chest injury

### indications for intubation & mechanical ventilation

definition:

- PEEP is the maintenance of positive pressure within the lungs throughout expiration which may be applied during mandatory ventilation or during spontaneous breathing when it is called 'continuous positive airway pressure' or CPAP

advantages:

- (i) increased airway pressure
- (ii) increased functional residual capacity (FRC) by prevention airway collapse
- (iii) recruitment of collapsed alveoli
- (iv) decreased airway resistance
- (v) reduced V-Q mismatch
- (vi) improved distribution of inspired gas
- (vii) reduced work of breathing
- (viii) increased  $PO_2$  due to increase in FRC
- (ix) prevention of surfactant aggregation reducing alveolar collapse

disadvantages:

- (i) impaired  $CO_2$  elimination
- (ii) reduced cardiac output
- (iii) reduced urine output through decreased GFR and increased ADH
- (iv) increased pulmonary vascular resistance (in West's zones 1 & 2 where alveolar pressure exceeds venous pressure)
- (v) decreased flow in West's zone 1 causing increased dead space
- (vi) may worsen right to left intracardiac shunt by increased PVR

### PEEP

## mechanical ventilation

### complications of intubation and ventilation

#### Equipment

Malfunction or disconnection

Incorrectly set or prescribed

Contamination

#### Pulmonary

Airway intubation (e.g. damage to teeth, vocal cords, trachea)

Ventilator-associated pneumonia (reduced lung defence)

VILI (e.g. diffuse lung injury due to regional overdistension or tidal recruitment of alveoli)

Overt barotrauma (e.g. pneumothorax)

$O_2$  toxicity

Patient-ventilator asynchrony

#### Circulation

↓ RV preload → ↓ cardiac output

↑ RV afterload (if the lung is overdistended)

↓ splanchnic blood flow with high levels of PEEP or mean  $Paw$

↑ ICP with high levels of PEEP or mean  $Paw$

Fluid retention due to ↓ cardiac output → ↓ renal blood flow

#### Other

Gut distension (air swallowing, hypomotility)

Mucosal ulceration and bleeding

Peripheral and respiratory muscle weakness

Sleep disturbance, agitation and fear (which may be prolonged after recovery)

Neuropsychiatric complications