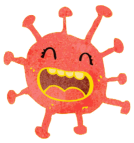
Early ARDS management in Covid-19



SUMMARY INFO BY: Kris Bauchmüller, Helen Ellis, Ajay Raithatha and Gary Mills - MARCH 2020

THE PRINCIPLES:

Ensure PPE use
Use lung-protective ventilation
Aim for negative fluid balance
Avoid aerosolising procedures
Deliver interventions in clusters
Optimise supportive care

MEASURES TO AID VENTILATION

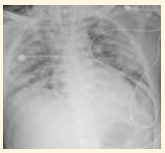
- Deep sedation
- Paralysis: bolus then infusion
  - Atracurium unless intolerance
- Negative fluid balance!
  - Avoid aggressive fluid resus (unless prior diarrhoea, vomiting etc.)
  - Use diuretics early (once CVS stability)
  - Furosemide boluses or infusion

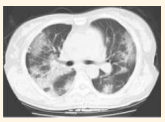
MECHANICAL VENTILATION

Problem: Stiff lungs, pulmonary oedema with protein-rich exudate, hypoxaemia

- Initial mode = PRVC
- Use predicted body weight (PBW): enter height and gender on vent
- Tidal volume: low! aim 6ml/kg PBW
- RR: start high: 20/min (can go to 30/min)
- PEEP: aim high (min 10cmH_2O) but individualise: if > 15-18cmH_2O beware CVS collapse
- Limit plateau pressure (Pplat): aim <30cmH_2O if possible; need to do inspiratory hold to see Pplat. Ppeak gives rough estimate if no obstruction
- SpO_2 target 90%; PaO_2>8kPa
- Allow high $PaCO_2$: as long as pH>7.15
- I:E ratio: start 1:1.4 (change from default on vent: 1:1.9)
- Consider recruitment manoeuvres (on ventilator; do not disconnect)
- Can use alternative modes of ventilation; APRV, inverse ratio etc. Use whatever you are familiar with.
- Early prone ventilation
- If deteriorating: ICU Consultant review

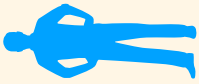
MONITORING AND IMAGING





- Routine
- CXR: on admission post lines (repeat if deterioration)
- CT: no clear additional role; avoid due to spread
- Lung ultrasound:
  - Diffuse B-profile (increase PEEP) or Atelectases/collapse (recruitment, proning)
  - Pneumothoraces, effusion (atypical) etc.
- In case of CVS deterioration:
  - 12-lead ECG
  - Echo
  - Daily troponin
  - Note: Covid-19 is associated with cardiomyopathy / myocarditis

PRONING THE PATIENT



- Insert all invasive lines and tubes before turning prone
  - NGT, CVC, A-line, catheter
  - Including vascath if CRRT potentially needed
- Prone for at least 16h at a time
- Turn supine and keep for 8h
- Repeat.
- May require multiple cycles
- Watch out for pressure areas: Nose, eyes, ears, mouth etc.
- Consider a dedicated proning team

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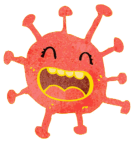

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VASOPRESSORS AND INOTROPES

- Noradrenaline as first line: Use 16mg/50ml to avoid frequent syringe changes
- Once Norad > 0.5mcg/kg/min: Hydrocortisone 50mg QDS + Vasopressin 2U/h + do ECG
- If cardiogenic shock: Consider Dobutamine, Milrinone or Adrenaline (ask ICU Cons)

LABS

- Routine ICU panel
  - Lymphopenia is common, WBC often normal
  - CRP often elevated
  - Elevated AST and ALT; AST/ALT ratio often > 1
  - Hyperglycaemia. Can be profound. Check ketones
  - Low albumin
- Procalcitonin: low in pure Covid-19. May indicate bacterial co-infection. Limited value in routine practice.
- Ferritin: high or rising ferritin may indicated hyperinflammation and "cytokine storm" which needs targeted therapy
- Viral throat swabs (routine)
- Separate Covid-19 samples
  - Throat swab may be false negative
  - Take deep tracheo-bronchial aspirate
- Blood cultures, sputum and others as indicated

ADDITIONAL TREATMENTS

- Antibiotics: Follow routine guidance
- Antivirals: Evolving area, local guidance will be based on emerging evidence and drug availability
- High dose steroids and anti-inflammatory drugs:
  - Steroids are not routinely recommended for all
  - May be required for suspected cytokine storm, along with Anakinra or other.
  - Refer to our local "Rapid Response Hyperinflammation MDT" via ICU Consultant
- ECMO: consider in extreme refractory hypoxaemia
  - Follow established referral pathways

DISEASE COURSE ON ICU

- Often gradual improvement and recovery
- May show rapid progression
- Beware "second hit" after initial improvement
- Delayed CVS collapse and arrhythmias reported
- Septic shock is rare: look for alternative diagnosis / additional pathogens

RENAL REPLACEMENT

- Consider in: electrolyte disturbance, acidosis, fluid overload
- ICU Cons decision
- Downsides are:
  - High nursing workload in PPE
  - Difficult disposal of infectious waste

BRONCHOSCOPY

- Generally do not use for diagnostic purpose; no clear change in therapy with positive diagnosis; significant exposure risk to staff; Risk of de-recruitment
- May occasionally be needed for mucous plugging

HOUSE-KEEPING

- Generally good supportive care
- Things to think about when having a spare moment:
- FAST HUG FAITH: Feed, Analgesia, Sedation, Thrombo-prophylaxis, Head-of-bed elevation, Ulcer prophylaxis, Glucose control, Fluid balance, Aperients, Investigations / Invasive lines, Therapies, Holistics (Family updates etc.)