

# Mechanical Ventilation Trouble Shooting

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# Case 1

- 10 yrs old boy known to have sickle cell disease placed on MV for progressive hypoxemia ?due to pneumonia vs ACS.
- Mode: SIMV +PS
  - $V_t = 8/\text{kg}$
  - IMV rate = 20
  - PEEP = 6
  - IT = 0.65
  - $\text{FiO}_2 = 0.5$
  - PS = 10



# Case 1

- After routine suctioning procedure the child developed hypoxemia.

## Your action??

- Possibilities: **DOPE** &
  - Displacement
  - Obstruction
  - Pneumothorax
  - Equipment Failure



# Assessment

- Cyanotic (refractory to increase FiO<sub>2</sub>)
- HR 135, BP 128/78, Temp 37.4°C
- Chest movement good and symmetrical
- + Audible leak
- Vent alarming (Low Minute Ventilation)
- Graphics erratic
- No synchrony with vent or bagging
- More??



PORTABLE

R

SUPINE AP

## Case 2

- 3 yrs old with craniosynostosis admitted to PICU post operatively.
- Intubated and sedated with midazolam on MV
- Called up by the bedside nurse for agitation and drop of O<sub>2</sub> saturation to 70s

What will be your immediate action?

What more information do you need?

# Questions to answer?

- Is it real? **Examine the patient**
- Any circulatory problem? **Vital Signs**
- Any acute change in ventilator ? **Alarms**
- Is it after some manipulation? **Ask the care giver**
- Any air entry to the lungs? **Auscultation**
- Is it symmetrical? **Inspection & Auscultation**
- Is the patient synchronizing with MV? **Inspect**
- Any significant airleak? **Listen**
- Any change of ET tube position? **Look**

# Case 2

- Patient is cyanosed
- Agitation and O<sub>2</sub> saturation of 73%
- HR 160, BP 120/72, Temp 38.1°C
- RR 52 with asynchrony & alarming ventilator
- Chest auscultation has symmetrical fair air entry
- MV parameters: VC mode, FiO<sub>2</sub> 0.5, Vt 8cc/kg, Rate 20, PEEP 5, IT 0.6
- One IV dose of Morphine sulfate was given(1 mg)
- Code Blue was called, why?

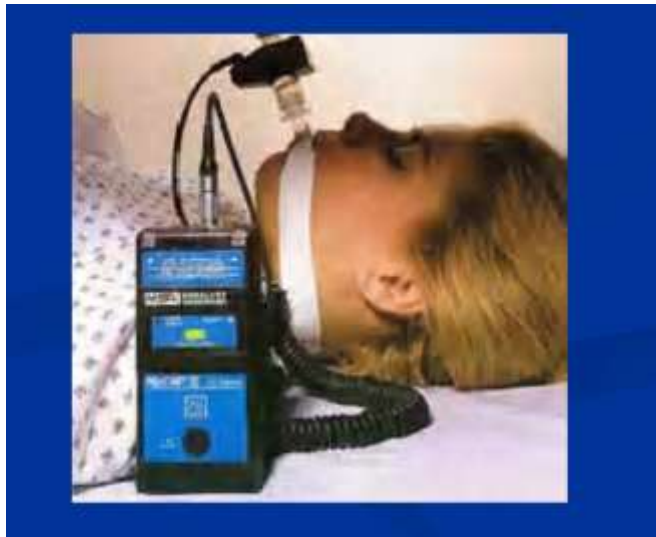
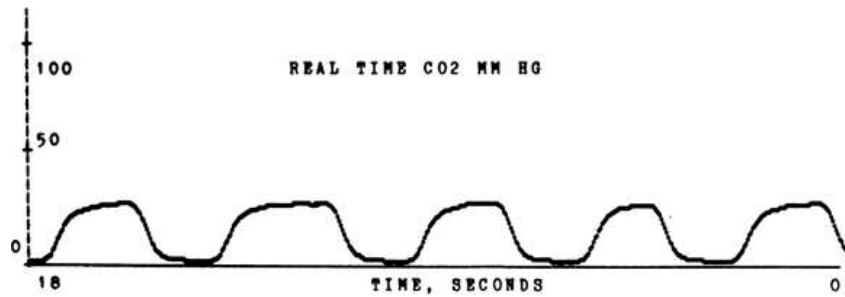
# Findings

- When connected to MV alarming as low Minute Ventilation.
- Bagging with 100% O<sub>2</sub> with no response.
- Chest movement not consistent with bagging or MV breath (no synchrony)
- Significant audible air leak
- Abdomen is getting more distended

What is your conclusion?

What other test you could do to confirm it?

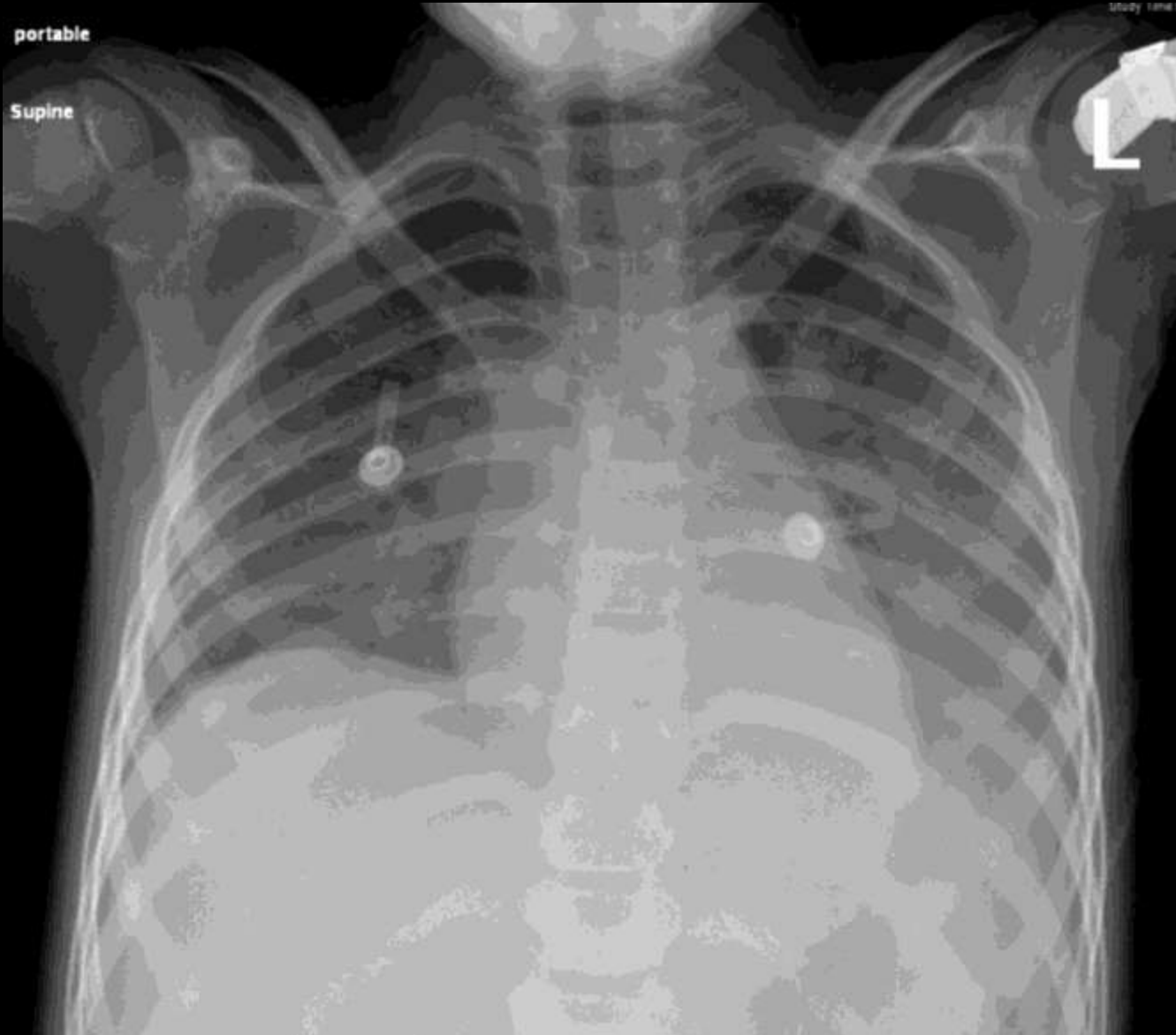
# ET CO2



portable

Supine

study time: 1



لا تصدق كل ما ترى  
ولا نصف ما تسمع

Chinese proverb



## Case 3

- An 11-yr-old boy post RTA
- Ventilated for severe head injury (GCS of 7).
- 4 days into his PICU stay the nurse has called you as the patient is dropping his sat.
- The ventilator was alarming as high pressure.

What will be your immediate action?

What more information do you need?

# Patient Assessment

- Agitated
- Chest movement is minimal but symmetrical (equal air entry)
- Ventilation mode is VC,  $V_t$  is 8cc/kg (not delivered?! - Pressure limitation 35)
- The change was sudden
- Suction catheter will not go (resistance?)
- Chest moves with bagging at higher pressure

????

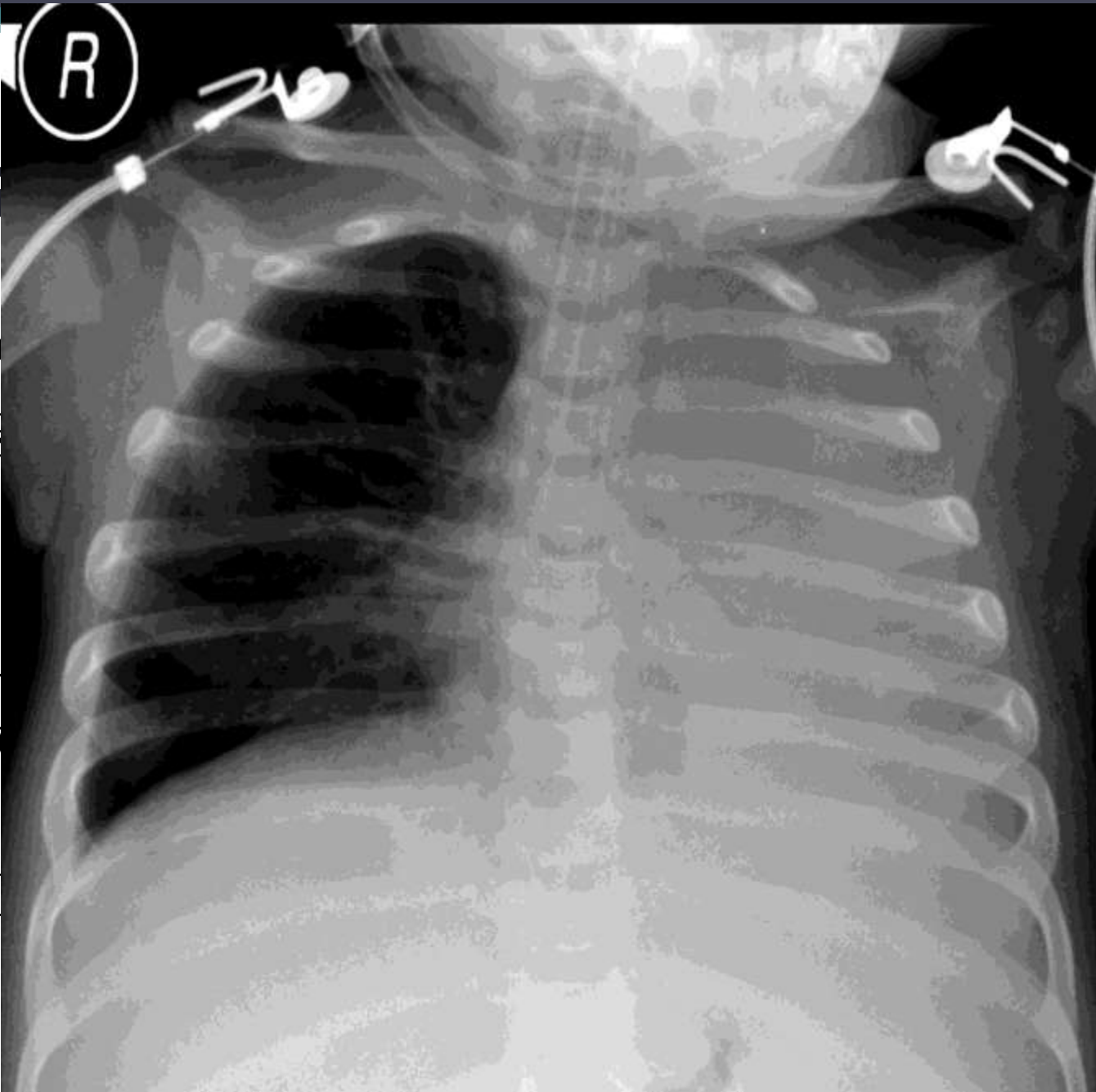
# Possibilities (DOPE)

- Displaced tube (deep)?
- Tube obstructed by secretions?
- Patient is biting the tube?
- Pneumothorax? Why?
- Ventilator tubing is obstructed ?
- Chest wall rigidity (Seizure)?

**DOPE: Disconnect the patient and bag**

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- ET
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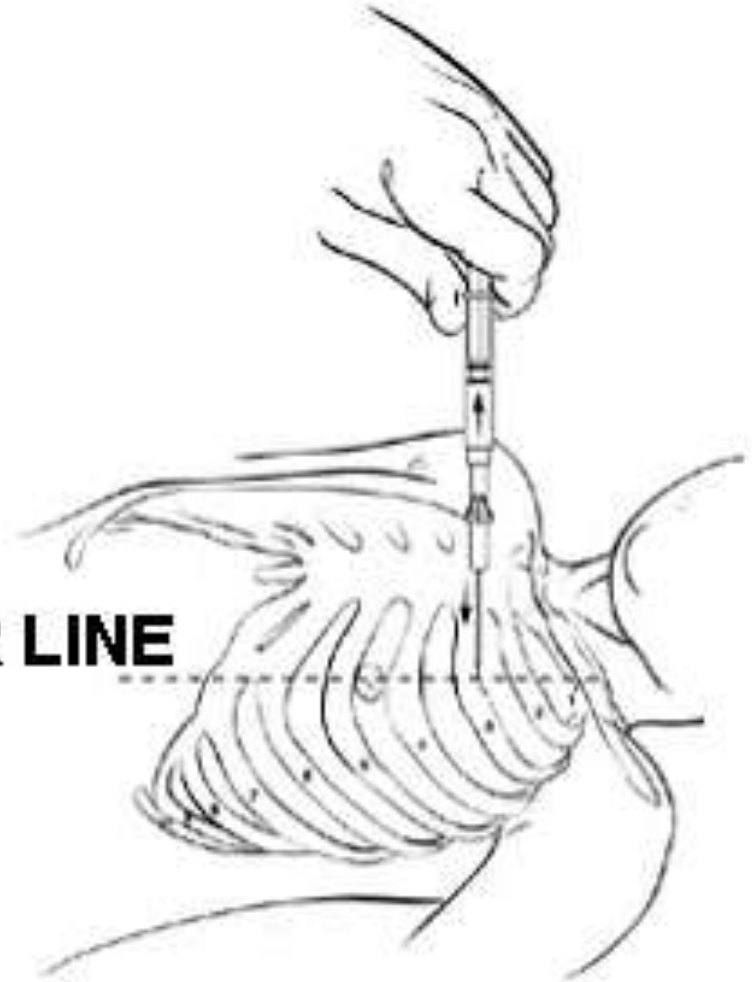
# ET Tube Obstructed

- Secretions, kinked, patient is biting!!
- Tube position ok
- High pressure alarm on vent
- Can be bagged usually with more pressure
- Air entry fair and equal and synchronous with bagging
- Suction catheter not going in (what level?)
- Patient exam will confirm (inspect the tube)
- If biting, need sedation, bite block .

# Pneumothorax

- Decreases
- (can be
- ?bulge,
- High pr
- Worse v
- BP, HR,
- Needle i
- CXRay t
- (don't w

**MID-CLAVICULAR LINE**





# Equipment Failure

- Disconnect and bag
- Not any of the previous problems
- Improve with ambu bagging at reasonable pressure → Equipments to blame
- The ventilator messages will help:
  - Low exhaled Vt
  - Low pressure alarm → ?leak in the circuit
  - High pressure alarm → obstructed tubing
  - Check Vent Graphics

# Case 4

- مريض عمره 35 سنة مصاب بقصور تنفسي مزمن وموضوع على جهاز المنفسة
- أثناء زيارة رجل الدين حاول أن يتكلم ويعطي إشارات ولم يفهمه رجل الدين
- كتب على ورقة بعض الكلمات وهو ينازع
- أخذها رجل الدين ووعدته أن يسلمها لأهله
- مات الرجل ورجل الدين يقرأ الصلوات
- أخذ رجل الدين الورقة وسلمها لأهله كما وعده
- فتحت زوجته الورقة وقرأت:



مشان الله

رفاع رجلك عن أنبوب المنفسة

رح أختنق

# Case 5

- 1 yr old girl who had huge cervical and glossal hemangioma that obstructed the upper airway and needed tracheostomy pending definitive therapy.
- Day 1 post trach placement she developed few attacks of cough followed by cyanosis
- **Your immediate action??**

# Observations

- Cyanotic
- Excessive respiratory efforts (retraction)
- High pressure alarm
- Not very difficult to bag
- Good inspiratory sounds (bilateral)
- Improved with bagging, worse when on MV
- More? Some difficulties in passing suction catheter initially (blood clots) then ok

# Case 5

- Pink on 0.5 FiO<sub>2</sub>
  - Distressed
  - CXRay pending
  - CBGs: 7.22, 65, 120, 21, -3
  - Vent: PRVC  
Vt 8cc/kg, PEEP 5, Rate 25, IT 0.5 sec.
- 
- What could it be?
  - What is the treatment?

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A. JOMANA  
Study Date:08/02/1431  
Study Time:01:58:07  
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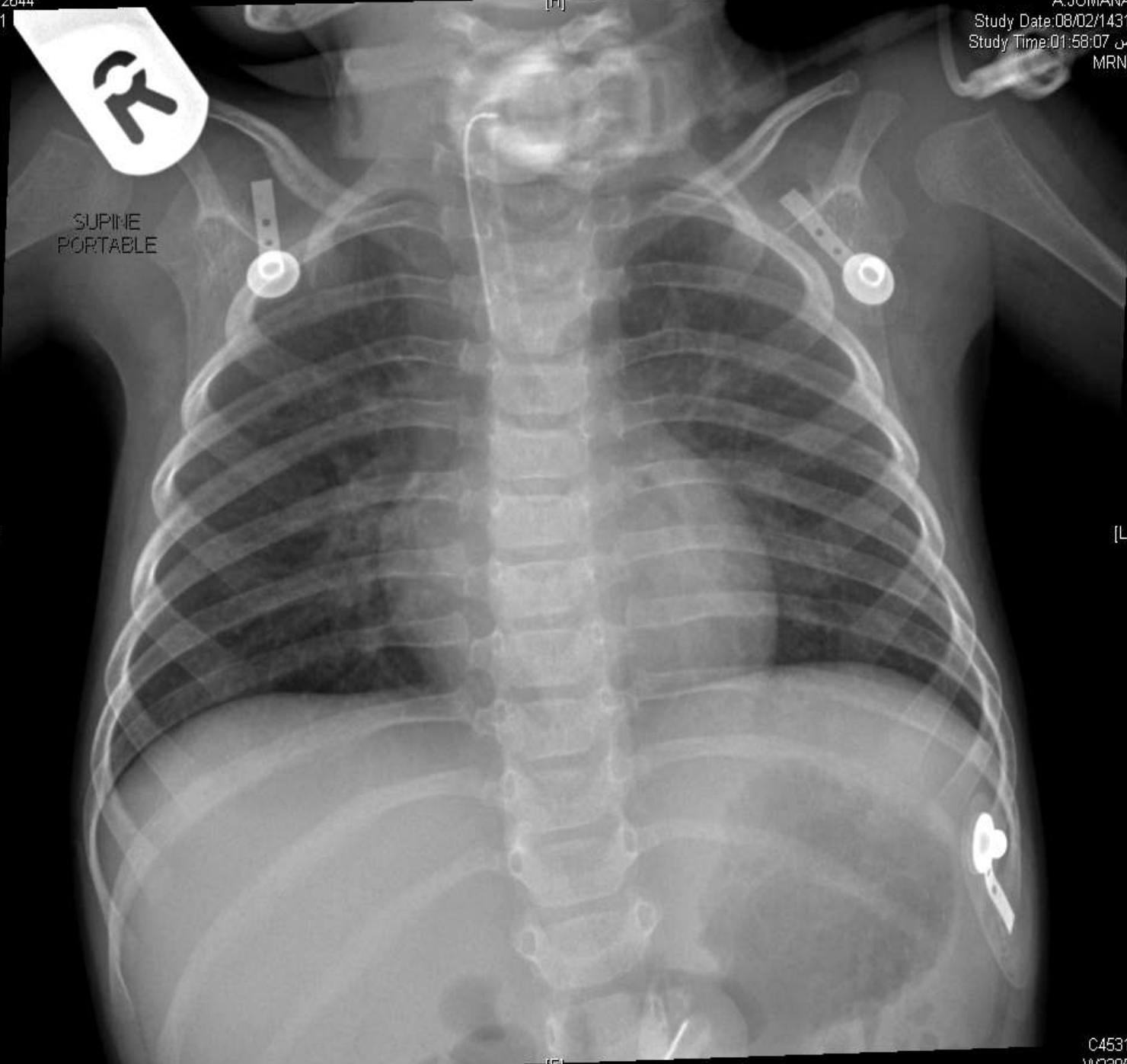
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# Case 6

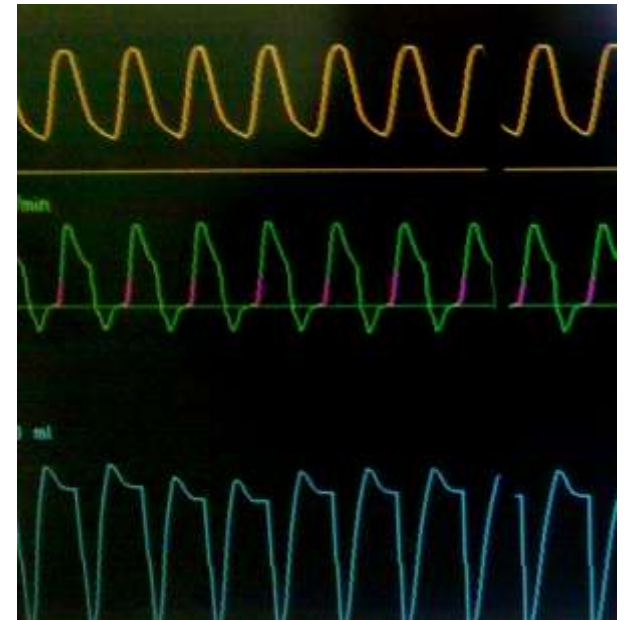
- 1 week old neonate with decreased LOC due to Urea Cycle Defect crisis.
- Intubated due to lack of protective reflexes
- CBGs:  
pH 7.59, PaCO<sub>2</sub> 19, PaO<sub>2</sub> 95  
Bicarb 19, BE - 4
- What do you want to know?

# Assessment

- Pink in FiO<sub>2</sub> of 0.25
- Semicomatose respond only to pain by minimal movement
- On fentanyl 1 mic/kg/hr infusion
- Vent: PC mode  
PIP 24, PEEP 5, Rate 30, IT 0.4
- What else?

# Your Response??

- ? $V_t = 15$  cc/kg
- ?RR = 60
- ?Triggering sensitivity:  
Flow trigger (++ sensitive)
- ?Water in the circuit
- ?Leak



# Case 4

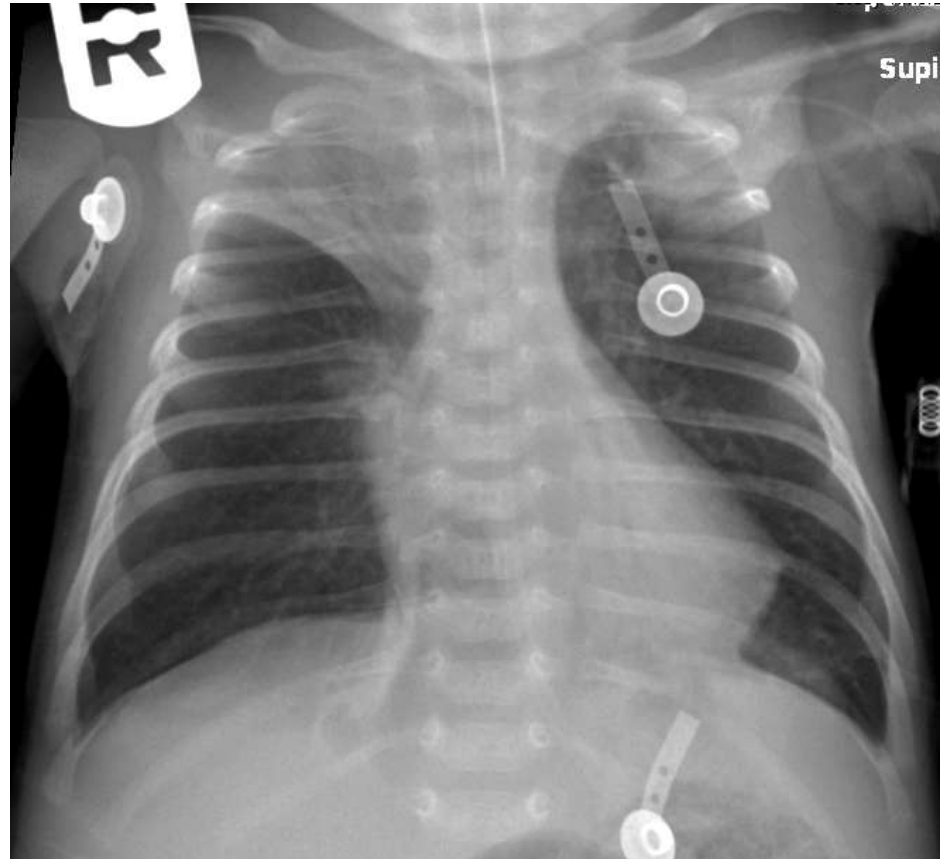
- 4 months old with RSV+ infection and resp failure on MV.
- Bilateral Crepitation & wheezing
- ABGs:  
pH 7.27, PaCO<sub>2</sub> 65, PaO<sub>2</sub> 85, Bicarb 26
- What do you like to know?

# Observation

- Pink on 35% O<sub>2</sub>, O<sub>2</sub> sat 94%
- No distress, RR = 37
- Good air entry bilat
- Sedated with Midazolam & Fentanyl
- Why ABGs are like that?

# MV settings

- FiO<sub>2</sub>: 0.35
- Mode: PRVC
- Vt: 10 cc/kg
- PEEP: 5
- Rate: 30
- IT: 0.5



- What will you change??

# Why PaCO<sub>2</sub> is high

- Machine or Patient?
- Minute Ventilation or Dead Space?
- Faster rate or slower?
- The patient will tell you:
  - Breathing fast
  - Good chest expansion
  - Obstructive auscultation  
(wheezing, prolonged expiratory phase)
  - Graphics & measured auto PEEP

# *Thank You*

