Respiratory Complications of Burns

Case Study
Case Study: The house fire

You are given the heads up by EMC that paramedics have responded to a house fire.

They are bringing one child to the ED
The paramedics report that the child is male, age 3 years with burns to his head and face, back, chest, and arms.
Case Study: The house fire

What are you thinking at this point?
Adult vs Child “Rule of 9’s”

Adult 63% burns

Child 72% burns
Case Study: The house fire

He is conscious and responding appropriately. Respiratory rate is 40/min, HR 155, BP not taken due to burns on both arms.

The paramedics were unable to obtain IV access due to burns on the child's arms. IO deferred because of patient’s LOC and quick access to ED
Case Study: The house fire

What are you thinking at this point?
Case Study: The house fire
Case Study: The house fire

Facial burns
Soot in nares/mouth
Horse voice
Reddened pharynx
Cough
Strider/wheeze
Tracheal tug/general increased WOB
Respiratory Distress
Case Study: the house fire

The ambulance arrives and the child is brought to the trauma room. He is alert and oriented and crying hoarsely.
Case Study: the house fire

Vital signs are:
RR 40/min
HR 150/min
BP 100/70
SpO₂ 100% on non-rebreathing mask @15L/min, and he is complaining (hoarsely) about the mask.
Case Study: The house fire

What are you thinking?
Case Study: the house fire

The decision is made to try for IV access. An IV is successfully inserted in the right foot.

The child’s vial signs are stable but he is now stridulous and his WOB has increased. He has a tracheal tug, and moderate indrawing.
Case Study: the house fire

What are you thinking
Case Study: the house fire

Why intubate?
Case Study: the house fire

Why intubate?

- Maintain airway patency
- Protect against aspiration
- Pulmonary toilet to decrease mucous plugging and infection risks
- Need for positive-pressure ventilation
Case Study: the house fire

The decision is make to intubate.

What are you thinking?.
Case Study: The house fire

What are you thinking?.

WHO?

WHEN?

HOW?

WHERE?

WHAT?
Case Study: The house fire

Normal laryngeal view
Case Study: The house fire

Laryngeal thermal burns.
Case Study: The house fire

The decision is made to move the child to ICU and intubate there because of access to resources.
Case Study: The house fire

Post intubation concerns.....
What are you thinking....
Case Study: The house fire

Post intubation concerns.....
Case Study: The house fire

Post intubation concerns.....
Case Study: The house fire

Post intubation concerns.....
Case Study: The house fire

Post intubation concerns.....
Case Study: The house fire

Other considerations for maintaining airway

- Sedation
- Paralysis
- Careful positioning/movement
- Stabilization of ETT
- Check of ETT markings
Case Study: The house fire

Other considerations for maintaining airway

- Burn care of face
- Daily CXR
- Oral hygiene
- Repositioning of ETT
Case Study: The house fire

Ventilation is initiated using volume control ventilation

If the patient weighs 18kg, what would be a tidal volume for lung protective strategy?

Where would you set PEEP?

Where would you set peak inspiratory pressure?
Case Study: The house fire

Initial blood gas results (art)

pH 7.25
pCO2 40
pO2 290
BE -7
O2 Sat 88%
Case Study: The house fire

What are you thinking – how would you change those blood gasses?
Case Study: The house fire

What is the significance of the low oxygen saturation on the blood gas (88%) compared to pulse oximetry (96%)?
Case Study: The house fire

Carbon monoxide poisoning

- Low saturation compared to paO2
- Metabolic acidosis
- Saturation “gap” between pulse oximetry and calculated oxygen saturation on blood gas

Case Study: The house fire

Your patient is now 5 days post admission. This morning his arterial blood gasses were:

- pH 7.20
- pCO2 60
- pO2 65 on FiO2 of .3 (previously 98)
- BE +2

**Vital signs**
- HR 135
- BP 115/70
- SpO2 88%
Case Study: The house fire

What are you thinking?
Case Study: The house fire

Lung Tissue Injury
Case Study: The house fire

What contributes to lung injury in burns?

- Ongoing mucosal injury
- Inflammation
- Alteration of AC membrane
- Increased secretions
- Increased risk of infection
- Airway plugging, hypoxemia

Pneumonia
ARDS
Surfactant inactivation
Case Study: The house fire

Treatment – what are you thinking?

What are you going to do about those blood gasses?
Case Study: The house fire

You notice the following pressure volume loop

What does it show?
Case Study: The house fire

What are the causes of poor compliance in inhalation injury and burns?
Case Study: The house fire

Deep chest burns – decreased chest wall compliance
Case Study: The house fire

Second Degree Circumferential  
or Second or Third Degree  
Noncircumferential

Control Edema  
1. Elevate head and chest  
   15 to 20° if hemodynamically stable  
2. Controlled fluid treatment

Assess Ventilation

Third Degree Circumferential

Perform Escharotomy Early

No Restrictive Impairment Evident

1. Continue close observation
2. Think of restrictive defect if there is cardiopulmonary deterioration

Increasing Work Impaired Gas Exchange

1. Consider restrictive defect
2. Mechanical ventilator assist (or CPAP)

Patient Stable

1. Continue close observation
2. Think restrictive defect if there is cardiopulmonary deterioration

Increasing Dysfunction

1. Perform chest wall escharotomy