Case

John Doe, 17M football player collided with teammate on the field and went down on his knees

Suffered one episode of hemoptysis and then dropped to the ground

Had chest pain, along with some difficulty breathing with movement and speaking, along with several more episodes of hemoptysis

Differential?

What happens next?
Fieldside management

Â Usually athletic trainer/physiotherapist present at games, occasionally will have physician present
Â Primary survey & resuscitation/stabilization

Â Airway
  Â Establish patent airway
  Â Stabilize c-spine if trauma
    Â If concern for trauma, keep helmet on but remove facemask
    Â Keep pads on
  Â Administer high-flow oxygen (no absolute contraindications for oxygen)

Â Breathing/ventilation
  Â Assess breathing and need for passive ventilation, if patient not actively breathing on his own
  Â If needed, may use adjunctive airway devices such as oropharyngeal tube, LMA, ET tube
  Â Attach AED if needed or concern for cardiac issue

Â Circulation
  Â Control external bleeding with direct trauma
  Â Early fracture immobilization to control bleeding if indicated
  Â Start IV fluids if shock present

Â Disability
  Â Assess neurological function (measure GCS, pupillary size/response)

Â Exposure
  Â Complete survey and exposure to avoid missing injury or compromise
  Â Keep patient normothermic

Â Secondary survey, reassess, and get to definitive care
Physical exam

- At fieldside, BP normotensive, Gen: mildly distressed, diaphoretic, HEENT: bloody oral mucosa, abrasions, spitting up blood, CV: regular rate/rhythm, chest wall tenderness to palpation over sternum, no gross deformities in ribs, Resp: CTAB, equal breath sounds, Abd: soft, NT, ND, bowel sounds present, Neuro: AAO x3, moves all extremities, no headache, Differential diagnosis?
History

• PMH: unremarkable
• PSH: unremarkable
• SH/FH: unremarkable
• No meds/allergies
• Differential diagnosis?
• What tests to order?
CT imaging
Differential diagnosis

- Pneumothorax
- Hemothorax
- Pneumomediastinum
- Pulmonary contusion
- Abdominal organ injury
Hospital course

- In hospital, underwent CT scan of chest and abdomen, showed pulmonary contusion
- Diagnosed with pulmonary contusion
- Vitals monitored closely, but remained hemodynamically stable
- Labs obtained, all within normal
- Supplemented with oxygen, chest physiotherapy performed, IV fluids given
- Observed overnight and then discharged
Pulmonary contusion (PC)

- Commonly follows trauma to chest wall area and is most common complication of blunt chest injury

- Most commonly occurs in high-energy trauma, such as motor vehicle accidents (90%)

- Rarely in athletes and few documented cases in literature, mostly in contact sports such as football
Pulmonary contusion

Mechanism: alveolar hemorrhage and destruction

- Pathophysiology thought to involve surfactant dysfunction combined with epithelial cell and neutrophil apoptosis

Characterized by parenchymal hemorrhage, interstitial edema, alveolar collapse
Diagnosis

• Clinically presents with dyspnea, tachypnea, hypoxemia, hemoptysis, chest pain, wheezing

• CXR initial imaging study of choice
  - Focal/diffuse opacifications diagnostic and may develop up to 48 hours after injury

• CT thorax is preferred imaging modality
  - Highly sensitive and can quantify injury
  - Good predictive value for prognosis depending on % of lung involved (> 18% confers increased morbidity/mortality)
Management

Treatment is generally supportive

- Pain control
- Supplemental oxygen
- Chest physiotherapy
- IV fluids
- Hemodynamic monitoring
Management

Analgesia

- Limited evidence on different modalities
- Small randomized trial in trauma patients in 1989 comparing continuous epidural vs. intermittent IV injection
  - Epidural group had shorter length of ICU/hospital stay, and decreased ventilator days
- 4 randomized studies in elective thoracic surgery patients showed improvement in subjective pain score and pulmonary function
Management

Mechanical ventilation

- Early studies in 70s initially showed decrease in size of experimental PC vs. control with intubation and mechanical ventilation
  - No increase in mortality benefit
- Case-control trial and prospective studies by Shackford showed worse outcomes with mechanical ventilation due to its complications
  - Decreased mortality with decreased ventilation rates
Management

Ç CPAP

- Prospective study by Tanaka compared patients with historical controls treated with mechanical ventilation
  Ç CPAP groups had lower rate of complications from pneumonia, atelectasis, and significantly lowered ventilation rate

- Prospective randomized trial by Gunduz comparing CPAP with PCA vs. mechanical ventilation
  Ç CPAP groups had lower rate of nosocomical infections and higher survival rate
Management

IV fluids

- Mainly animal studies regarding crystalloid vs. colloid for resuscitation → some evidence that plasma led to smaller lesions than LR in dogs
- Unable to replicate in single limb study in humans
- Recommend resuscitation as necessary until hemodynamically stable
Management

Steroids

- Dog study with experimental PC tested administration of Solu-Medrol 30 minutes after injury
  - Ratio of contused to normal lung decreased and less volume injury
  - Dogs killed, so unable to assess mortality
- Small retrospective study in humans by Svennevig showed decreased mortality
  - Non-randomized, non-standardized administration of steroids
Management

Vasopressin

- Small study involving contused pigs subjected to controlled and uncontrolled bleeding with subsequent crystalloid resuscitation
- Decreased mortality, blood loss
- Possibly more studies in future
Complications

- Short term potential sequelae include pneumonia, acute lung injury, acute respiratory distress syndrome, traumatic pseudocysts
  - If ARDS, mortality may approach 25% in general population
  - Young athletes with isolated contusion not associated with mortality
Complications

Traumatic pulmonary pseudocyst
- Rare formation of cystic lesions
- 85% documented in those under age 30
- Symptoms include hemoptysis, chest pain, dyspnea, occasional leukocytosis
- Diagnosed on CXR 50% of time, otherwise CT scan gold standard
- Symptomatic treatment, similar to that of pulmonary contusion, including pain control, chest physiotherapy, oxygen
- Outcome good, as generally resolve in 2-3 months
Pulmonary contusion

- No evidence on return-to-play guidelines for pulmonary contusions.
- Pulmonary contusions generally resolve within 7-10 days.
- In general, athletes returned to exercise within 2-3 days, full participation within 1 week in all documented case reports.
- No documented long-term sequelae in the football players and diver.
Case

- Athlete monitored, subsequent CT scan showed improving PC
- Cleared to return to activity
Fieldside management

Pneumothorax

- Dyspnea, tachycardia, pleuritic chest pain
  - Tension pneumothorax: hypotension, tracheal deviation, distended neck veins
  - Manage ABCs, initiate supplemental oxygen immediately
  - If suspect tension PTX, use 14 or 16 gauge needle in 2nd intercostal space at midclavicular line
    - Palpate for angle of Louis, slide finger parallel toward side of suspected tension, will meet articulation of 2nd rib and sternum; directly below this is second intercostal space
    - Insert into lower half of space to avoid neurovascular bundle beneath rib
    - Should be followed by rush of air and clinical improvement
Fieldside management

Anaphylaxis
- Manage ABCs
- Initiate supplemental oxygen immediately
- Remove causative agent (e.g. bee stinger)
- Administer epinephrine, repeat q3-5 minutes
- Obtain IV access, resuscitate if hemodynamically unstable
Fieldside management

• Complete airway obstruction (facial trauma, swelling, tracheal injury)
  ï Manage ABCs
  ï If unable to obtain airway, may need to perform needle cricothyroidotomy
    ñ Palpate thyroid cartilage and notch, and slide fingers inferiorly until between thyroid and cricoid cartilage \(\rightarrow\) cricothyroid membrane
    ñ Stabilize trachea with fingers
    ñ Insert large-bore cannula (12-14G) with syringe into cricothyroid membrane and angle 45 degrees caudally while aspirating for air (if present, in trachea)
    ñ Withdraw syringe while advancing cannula and attaching to 3-way tap
    ñ Hold cannula and 3-way tap with one hand, occlude third port of tap for one second to allow oxygen flow in, and then release for 4 seconds to allow for expiration
References