Troubleshooting a Chest Drain.

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Acknowledgements:

• A lot of people including:
  – Mary Dunford
  – Craig Herbert
  – Richard Morris
  – Ben Siggers
  – Caesar Ursic
  – Helen Ward
Some Anatomy & Physiology

Pleural Pressures [cmH2O]

Inspiration    Expiration

Spont  ?  ?  

IPPV  ?  ?  

[Image of anatomical diagram]
Some Anatomy & Physiology

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<th>Inspiration</th>
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<tr>
<td>Spont</td>
<td>-10</td>
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<td>IPPV</td>
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Pleural Pressures [cmH2O]
A Pneumothorax  [you tell me]

• Closed
  – Tear or bleb in lung
  – Can reabsorb or tension [esp. IPPV]

• Open
  – Connects to outside
  – SV: lung collapses
  – IPPV: lung OK

• Tension
  – Pleural air under pressure
  – Subcut. emphysema, deviated trachea
  – Distorts meadiastinum
  – Causes circulatory collapse
  – Urgent to convert to open or drain it.
Incident Reporting
Australian Patient Safety Foundation

• Disconnection of tubes when moving patient
• Drains inadvertently pulled out
• Connections round the wrong way
• No water in the bottle
• Cap left on vent
• High suction used
• Drain left clamped till reviewed
• Non standard drainage systems failing.
Understanding a Chest Drain System
Underwater Sealed Drain

- A one way valve
- Prevents the inflow of air because it is 80 cm below the patient [A].
- Permits the outflow of air/fluid with a small pressure [B].
Simple UWSD
Tyco Aus-Seal 2000
What problem as it fills up?

Higher pressures needed to vent air. [B]
Why use suction?

- Aids drainage
- Recreates normal negative pressure
- Keeps pleura empty - promotes healing

But:
If you use high pressure [unregulated] suction it can damage the lung.
Low Pressure Suction.

• Need a low pressure regulator set to –15 mmHg

• Or need a more complicated system [4 bottle] if you use unregulated suction.
What happens if the suction is blocked?
What if the suction is blocked?

Positive pressure relief valve vents excess pressure.
4 Bottle System

- Advantages:
  - No problem as it fills up
  - Don’t need low suction
  - Positive pressure relief

- Disadvantage:
  - Harder to understand.
Four Bottle UWSD

Pressure relief valve  Drainage bottle  Underwater seal  Suction controller
Pressure relief valve

Suction controller

Underwater seal

Drainage bottle
How to Review a Chest Drain

• Look at the Patient first:
  • Is there air or fluid left in the pleural cavity?
  • Is there a tension pneumothorax?

• Look at the Drain:
  • Is the system assembled properly?
  • Is the suction working?
  • Is the system blocked?
  • Is the system leaking?
Look at the Patient First

• Is there air or fluid left in the pleural cavity?
  • Overinflated, resonant, reduced air entry
  • CXR

• Is there a tension pneumothorax?
  • Cardiovascular compromise
  • Tracheal deviation
  • Subcutaneous emphsema.
Is System Assembled Properly?

- Decide what system is in use
- Confirm it is correctly assembled
- Check water level in bottle
- Check bottle upright and below patient
- Remove all clamps
- Check there are no fluid filled loops.
Is Suction Working Properly?

- Listen to confirm it is not blocked or disconnected

- Check gauge reads –15 mmHg with finger over end.
Is Drain Blocked?

- When in continuity with air or fluid in pleural cavity the underwater seal will swing in the tube with each breath when off suction

- No swing means either:
  - Drain system blocked
  - Chest tube blocked or misplaced
  - No air or fluid in pleural cavity.
Is There an Air Leak?

- Air bubbling in the underwater seal indicates an air leak.

- If bubbling continues on suction when tube is clamped near patient there is a leak in the drain system.

- If there is bubbling present off suction then there is air in the pleural cavity
  
  A small amount of air is revealed with a cough or large IPPV.
Key Points to Review a Drain

• Look at the Patient first:
  • Is there air or fluid left in the pleural cavity?
  • Is there a tension pneumothorax?

• Look at the Drain second:
  • Is the system assembled properly?
  • Is the suction working?
  • Is the system blocked?
  • Is the system leaking?
References:

• Guidelines for insertion of a chest drain
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  – Thorax, 2003 May;58 Suppl 2:ii53-59

• Pleural drainage systems
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• Online education program
  – Thoracic Society of Australia & New Zealand
To buy a chest drain simulator visit:

www.simcentral.com.au