CHEST TUBES

Rural Critical Care Module

Rural and Remote,
Halifax 2019

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Objectives

- -Indications for closed chest drainage
- -Contraindications
- Why Seldinger technique and small tubes
- Hands on practice
- How do "underwater" drainage systems work

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RAISE YOUR HAND IF YOU HAVE ANY FINANCIAL CONFLICTS OF INTEREST IN THIS DECISION...
FDA DRUG DECISION PANEL
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CONCEPT-MIKE ADAMS -ART-DAN BERGER- WWW.NATURALNEWS.COM

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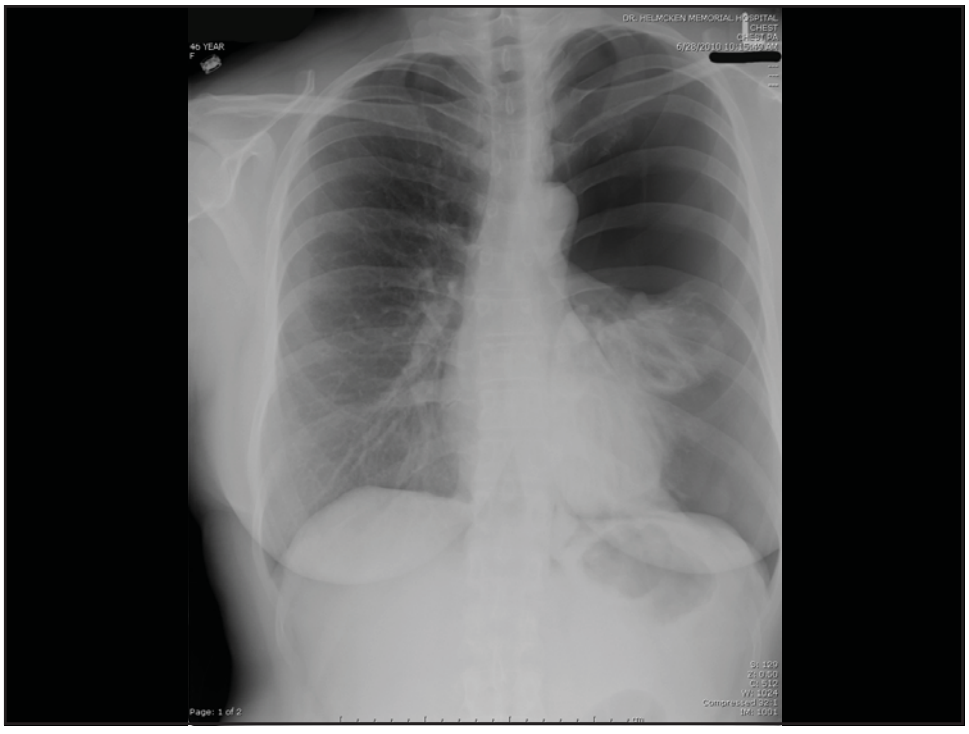
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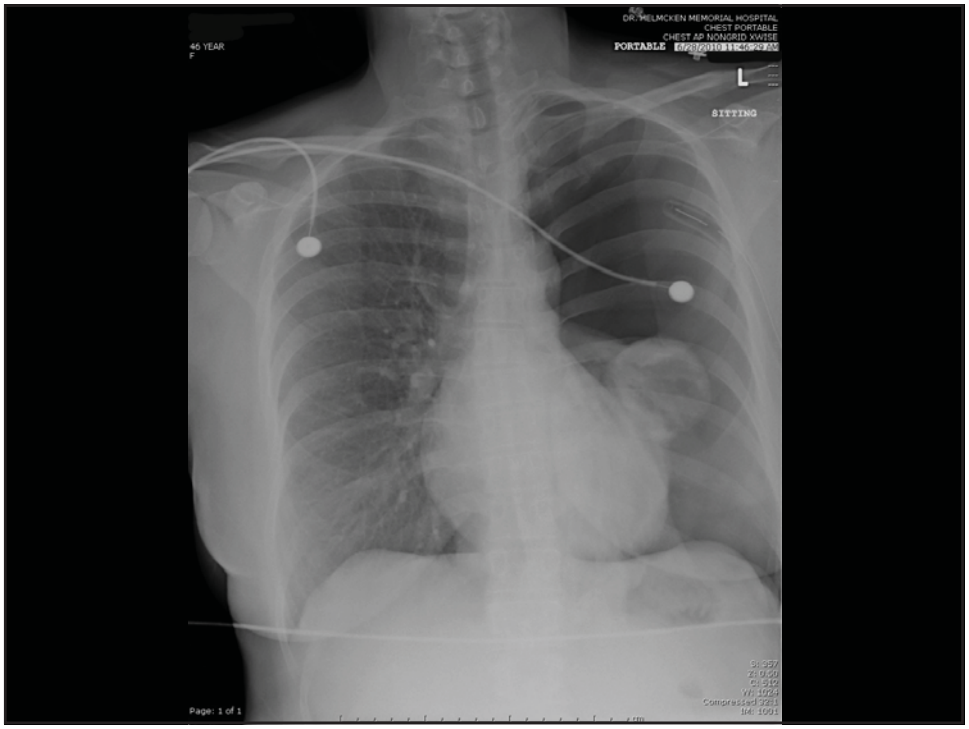
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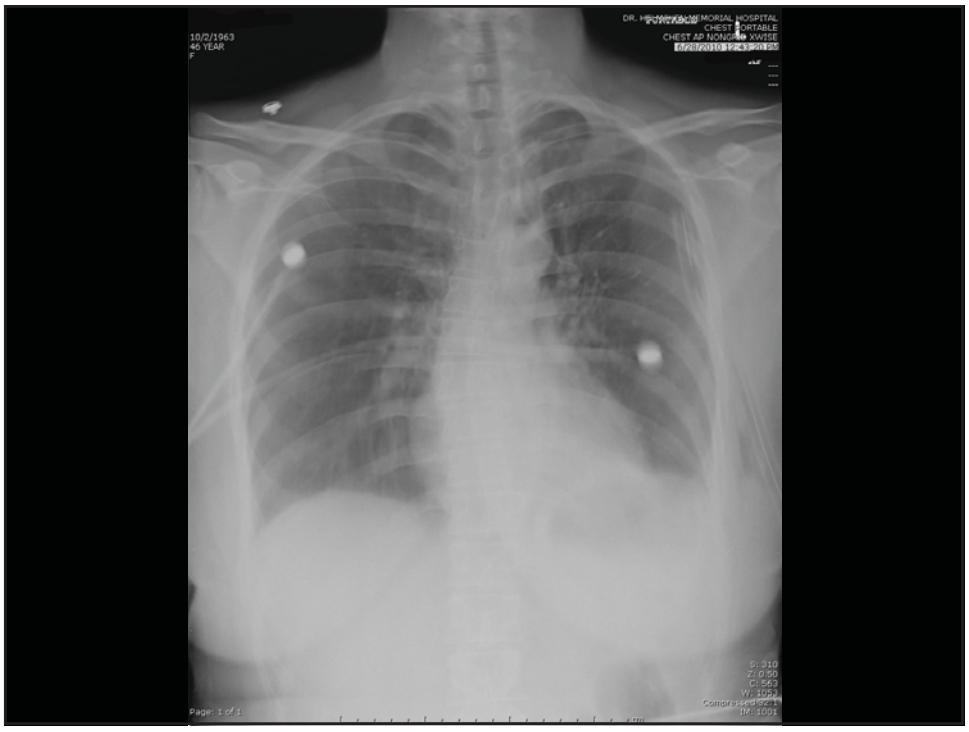
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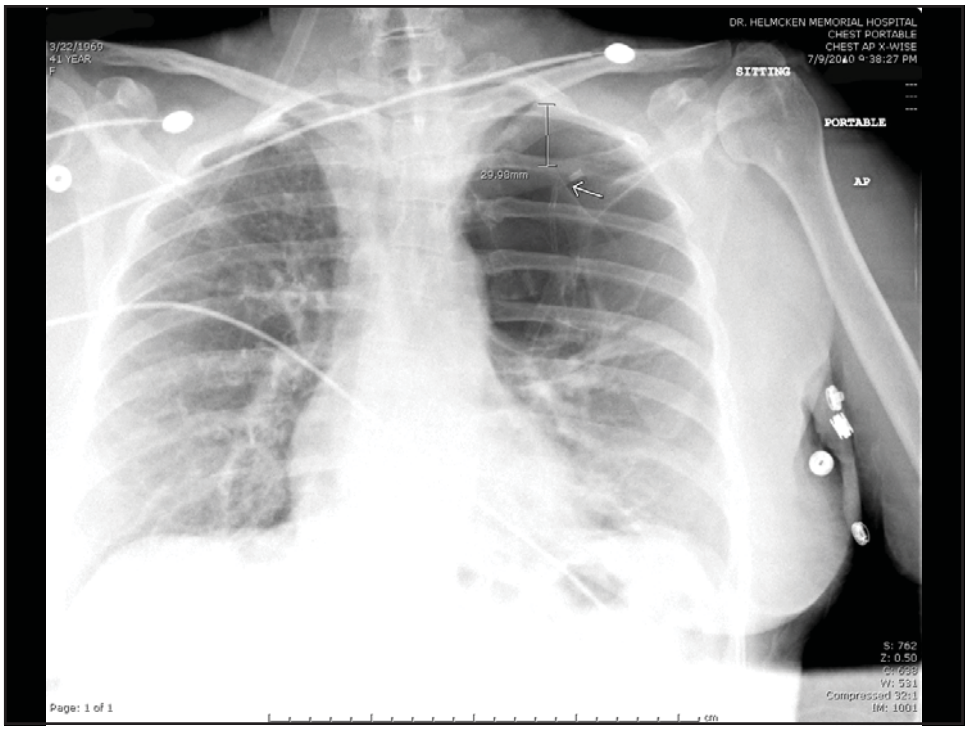
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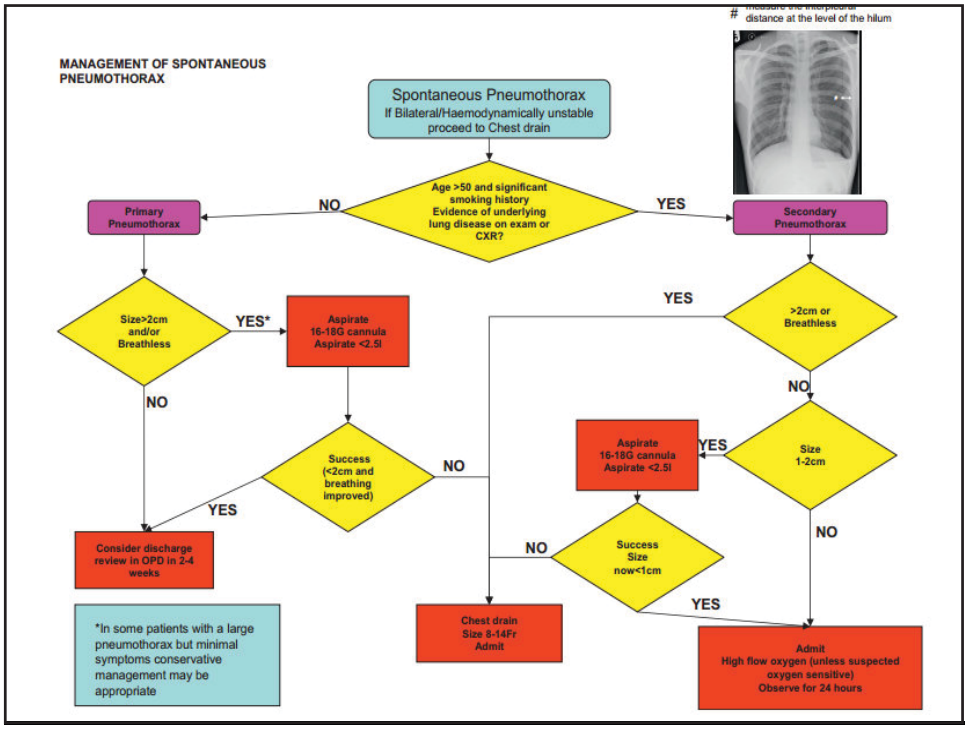
MANAGEMENT OF SPONTANEOUS PNEUMOTHORAX
Spontaneous Pneumothorax
If Bilateral/Haemodynamically unstable proceed to Chest drain
Age >50 and significant smoking history Evidence of underlying lung disease on exam or CXR?
NO
YES
Primary Pneumothorax
Secondary Pneumothorax
distance at the level of the hilum
Size>2cm and/or Breathless
YES*
Aspirate 16-18G cannula Aspirate <2.5l
NO
YES
>2cm or Breathless
NO
Success (<2cm and breathing improved)
NO
YES
Aspirate 16-18G cannula Aspirate <2.5l
YES
Size 1-2cm
NO
Consider discharge review in OPD in 2-4 weeks
NO
Success Size now<1cm
YES
*In some patients with a large pneumothorax but minimal symptoms conservative management may be appropriate
Chest drain Size 8-14Fr Admit
Admit High flow oxygen (unless suspected oxygen sensitive) Observe for 24 hours

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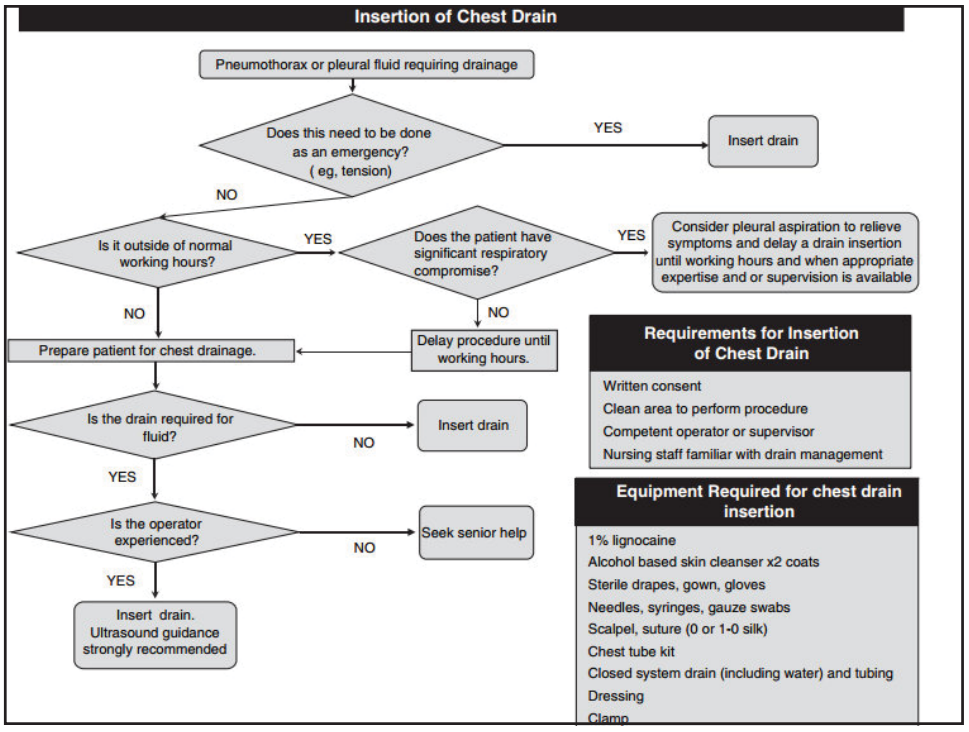
Insertion of Chest Drain
Pneumothorax or pleural fluid requiring drainage
Does this need to be done as an emergency? (eg, tension)
YES
Insert drain
NO
Is it outside of normal working hours?
YES
Does the patient have significant respiratory compromise?
YES
Consider pleural aspiration to relieve symptoms and delay a drain insertion until working hours and when appropriate expertise and or supervision is available
NO
NO
Prepare patient for chest drainage.
Delay procedure until working hours.
Is the drain required for fluid?
NO
Insert drain
YES
Is the operator experienced?
NO
Seek senior help
YES
Insert drain. Ultrasound guidance strongly recommended
Requirements for Insertion of Chest Drain
Written consent
Clean area to perform procedure
Competent operator or supervisor
Nursing staff familiar with drain management
Equipment Required for chest drain insertion
1% lignocaine
Alcohol based skin cleanser x2 coats
Sterile drapes, gown, gloves
Needles, syringes, gauze swabs
Scalpel, suture (0 or 1-0 silk)
Chest tube kit
Closed system drain (including water) and tubing
Dressing
Clamp

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Indications for Chest Tube

- Pneumothorax
  - Any ventilated patient
  - Tension pneumo after initial needle relief
  - Persistent/recurrent pneumo after simple aspiration
  - Large secondary spontaneous pneumo > 50 yo
- Hemothorax
  - Chest trauma (blunt or penetrating)
  - Postop (thoracic / upper abdo)
- Pleural effusion
  - Sterile, infected (empyema/parapneumonic), malignant, chylothorax, other
- Pleurodesis

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Contraindications

- Relative
  - Anticoagulation / Coagulopathy / Bleeding diathesis
  - Transudative pleural effusions from liver failure
- Cautions
  - Blind insertion risky in pt with pleural adhesions (infection, pleurodesis, surgery) -> CT or U/S guidance

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Tube Selection

- French/3 = diameter in mm
- Spontaneous or iatrogenic pneumo = needle aspiration OR small bore (8-14 Fr)
- Large risk of air leak (i.e. mech vent) = larger bore (20-28 Fr)
- Hemothorax = 32 Fr or larger

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Technique Selection

- Large pneumothorax (> 2 cm rim at level of hilum) = Needle aspiration (NA) OR Seldinger technique without imaging
  - Safe entry into chest
  - As effective as larger chest drains with less pain
  - No RCTs comparing NA and Seldinger technique, but 30% NA fail and require further intervention
- Loculated collection = U/S or CT during placement

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Landmarks

- 4th-5th intercostal space, anterior axillary or mid-axillary line -- "triangle of safety"
  - Males = nipple line
  - Females = inframammary crease
- Pneumothorax -> direct tube apically and anteriorly
- Hemothorax -> inferiorly and posteriorly

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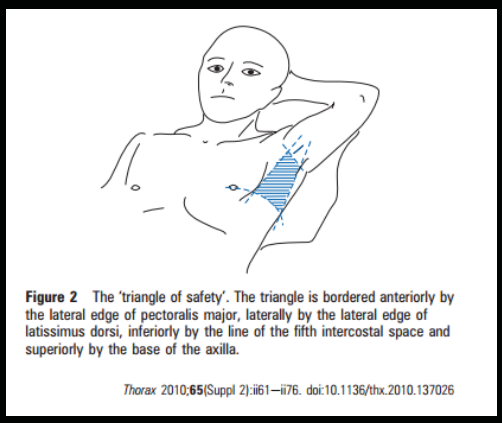

Figure 2 The 'triangle of safety'. The triangle is bordered anteriorly by the lateral edge of pectoralis major, laterally by the lateral edge of latissimus dorsi, inferiorly by the line of the fifth intercostal space and superiorly by the base of the axilla.

Thorax 2010;**65**(Suppl 2):ii61—ii76. doi:10.1136/thx.2010.137026

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Seldinger Technique

- Chest tube placed over a guidewire
- Advantages
  - Simple, less pain
  - Fewer complications
  - Useful for placement of small tubes that drain air and nonviscous fluids
  - Can be done without imaging if lung significantly displaced from chest wall at entry site
- Disadvantages
  - Unable to assess for adhesions (bleeding risk, can pass into lung parenchyma)

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Steps

- Supine, arm abducted, elbow flexed
- Full barrier precautions, prep skin
- Consider IV midazolam or morphine
- Anesthetize 2-3 cm area of skin and subcutaneous tissue 1 intercostal space below space that tube will go (tunnel)
- Anesthetize periosteum of ribs and intercostal space
- Avoid lower rib margin (neurovasc bundle)

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Steps

- Insert introducer needle into pleural space (aspirate to confirm)
- Insert guidewire through introducer needle (no resistance, direct appropriately)
- Small skin incision parallel to intercostal space
- Pass dilators sequentially over guidewire (1 cm beyond pleura)
- Pass chest tube/dilator combination into pleural space
- Remove dilator and guidewire
- Suture into place, dress, connect drainage
- Repeat CXR to assess position and expansion

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Suction

- Suction not routine
- 2 drainage systems
  - Underwater -> easy to convert to suction
  - Unidirectional valve (Heimlich) -> more mobile
- No re-expansion
  - Suction at –10 to -20 cm H2O

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Complications

- Tube malposition or blockage
- Infection
- Organ injury
- Re-expansion pulmonary edema (up to 14%)
  - Most likely with young patient, rapid re-expansion of large pneumo
  - Minimize by: clamp if coughing, CP, SOB, O2 desat, limit fluid drainage to 1-1.5 litres initially

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Complications

Table 2 Frequency of post-insertion complications for small drains (≤16 F)

Complication	Total no.*	Calculated frequency	Range	Studies
Injury	582	0.2%	0–2%	44–51
Malposition	593	0.6%	0–9%	45–52
Empyema	395	0.2%	0–2%	45, 48–51
Drain blockage	341	8.1%	2–18%	45, 48–52

*Total number of procedures performed from the studies found that quote this complication.

Thorax 2010;**65**(Suppl 2):ii61–ii76. doi:10.1136/thx.2010.137026

Table 3 Frequency of post-insertion complications for large-bore drains (≥20 F or stated 'large-bore drain')

Complication	Total no.*	Calculated frequency	Range	Studies
Injury	1572	1.4%	0–7.9%	44, 52–60
Malposition	1778	6.5%	1.1–31%	53–61
Empyema	1778	1.4%	0–2%	53–61
Drain blockage	115	5.2%	5.2%	52

*Total number of procedures performed from the studies found that quote this complication.

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Removing Tubes

- Lung fully re-expanded
- Pneumo = no air leak, no accumulation off suction or when clamped
- Effusion = fluid less than 100-300 mL/day

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Other Information

- Smoking cessation counselling is of utmost importance
- Patients can resume normal activity post pneumothorax (not associated with exercise/exertion)
- No diving
- No air travel until at least 1 week post full resolution (confirmed by imaging)

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References

- UptoDate "Placement and management of thoracostomy tubes"
- British Thoracic Society Pleural Disease Guideline 2010 "Management of spontaneous pneumothorax"
- British thoracic society guidelines
- quick-reference-guide/

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- https://www.youtube.com/watch?v=xsEanWSK8kE

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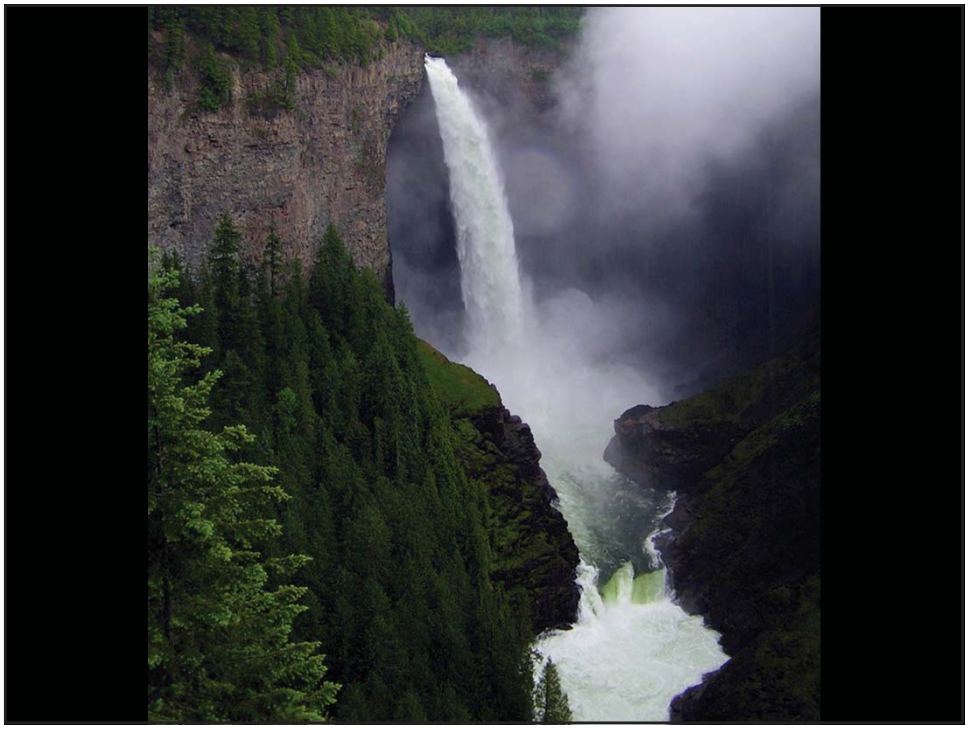

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