Role of bronchoscopy in hemoptysis

Vishwanath gella
Cold saline lavage

- First case of endobronchial irrigation with cold saline for hemoptysis reported in 1980¹
- Lavage with normal saline at 4° C - 50ml aliquots (avg volume of 500 ml, range 300–750 ml) stopped the bleeding in 23 patients with massive hemoptysis obviating the need for emergency thoracotomy²

¹ Conlan AA et al; Thorax 1980; 35: 901–904,
² Conlan AA et al J Thorac Cardiovasc Surg 1983; 85:120–124
Cold saline lavage

• 1 patient experienced transient sinus bradycardia during the procedure. Only 2 subjects suffered subsequent episodes of massive bleeding

• Also feasible with FOB, but rigid scope has better suction capacity enabling better view
Topical vasoconstrictive agents

• Effective in mild to moderate hemoptysis following bronchial brushing and biopsy procedures
• Not useful for massive bleeding, the drug gets diluted and washed away\(^1\)
• 13 of 76 patients in a study evaluating topical hemostatic tamponade therapy responded to vasoconstrictive agents\(^2\)

2) Valipour et al CHEST 2005; 127:2113–2118
Topical vasoconstrictive agents

- Agent – topical epinephrine (1:20,000)
- High plasma levels following endobronchial application
- Significant CVS effects – hypertension and tachyarrhythmias¹
- Alternative agents – terlipressin and ornipressin

¹ Mazkereth R et al; Crit Care Med 1992; 20: 1582–1587
Fibrinogen/thrombin

• Endoscopic instillation in 11 patients in whom BAE was not possible\(^1\)

• Cold saline f/b epinephrine, or collapse of the bleeding bronchus through continuous suction, and drying of the airway thereafter fibrinogen-thrombin combination instilled through a catheter within an FOB

  • \textit{de Gracia J et al. Respir Med 2003; 97: 790–795}
Fibrinogen/thrombin

- Immediate cessation in all patients
- Early recurrence – 2 patients, late relapse in 1 patient
- Tsukamoto et al - all 9 patients managed with a fibrinogen-thrombin mixture – immediate control of massive hemoptysis
- Can be used if other modalities not available
Endobronchial tamponade for massive hemoptysis

• First introduced by Hiebert in 1974
• Necessitates the use of a rigid or flexible bronchoscope
Endobronchial tamponade for massive hemoptysis

- Occluding the bleeding airway with fogarthy embolectomy catheter
- 4 Fr – segmental bronchi and 14 Fr for main stem bronchi
- Passed through FOB and scope is removed over the catheter
- Alternative – fogarthy catheter passed along the bronchoscope

Sakr L et al. Respiration 2010;80:38–58
• Fogarty catheter, 4-Fr (80 long), can be passed through a fiberoptic bronchoscope with a large inner channel (>=2 mm)
• Balloon at the distal tip of the catheter is inflated into the bleeding segmental bronchus as a hemostat
• Distal hub of the catheter is cut off to allow the removal of the bronchoscope by sliding it over the Fogarty catheter
• Pin plug used to maintain the cuff pressure

• Jean-Baptiste et al. Critical Care Medicine 2000; 28: 1642-1647
Double-lumen balloon catheter

- 6-Fr (170 cm long), better adapted to the flexible bronchoscope
- Balloon can be inflated by a detachable valve at the proximal end
- Vasoactive drugs - through the second channel
- Facilitates removal of the bronchoscope without modification of catheter - major advantage over the Fogarty catheter

• Central airways, segmental bronchi and even cavities (under fluoroscopy)
• Acts as a bridge to definitive therapy
• Balloon tamponade was successful in 26/27 patients who lost at least 100 ml of blood
• Deflated - few min 3 times/day to preserve mucosal viability and to check for bleeding recurrence

  • Freitag L et al Eur Respir J 1994; 7: 2033–2037
Modified techniques

• Kato et al – Modified bronchoscopic angiographic J guide wire\(^1\)
• PA balloon catheter

Lateralization possible not localization

- Unilateral intubation to protect non-bleeding lung from aspiration
- Right-sided bleeding – FOB advanced to the LMB and the left lung is electively intubated over the bronchoscope
- Left side bleeding – tracheal intubation followed by insertion of 14 French 100 cm Fogarthy catheter besides ET tube, guide into LMB bronchoscopically
Silicone Spigot

- Dutau H et al. Respiration. 2006; 73: 830-2
Topical hemostatic Tamponade therapy – ORC

• ORC – oxidized regenerated cellulose mesh – sterile fabric
• Introduced into the bleeding airway using FOB
• Lobar to sub-segmental bronchi
• Control of hemoptysis - achieved in 56 of 57 (98%) patients, who remained free of hemoptysis for the first 48 h

Topical hemostatic Tamponade therapy – ORC

• Mild to moderate bleeding (30–100 ml) recurred in 6 subjects (10.5%) 3–6 days after the procedure

• Not suitable for proximal sites of bleeding such as the trachea

• Temporary measure
Endobronchial Sealing with Biocompatible Glue

- Used in mild hemoptysis
- N-butyl cyanoacrylate - biocompatible adhesive that solidifies on contact with humidity
- Injected into the bleeding airway through catheter via FOB
- 6 patients prolonged mild hemoptysis – bleeding stopped in all patients
Laser Photocoagulation

- First introduced by Dumon et al in 1982
- Nd-YAG laser – effective option endoluminal tumours with symptomatic airway obstruction and/or bleeding
- Photocoagulation of bleeding mucosa, hemostasis
- Photoresection and vaporization of lesion
  - Sakr L et al. Respiration 2010;80:38–58
Argon Plasma Coagulation (APC)

- Noncontact electrocoagulation tool
- Argon plasma medium is employed to conduct high-frequency electrical current through a flexible probe
- Blood is a good conductor for the high-frequency current
- Effective dessication of a bleeding bronchus

*Sakr L et al. Respiration 2010;80:38–58*
Argon Plasma Coagulation (APC)

- Dessication of targete surface achieved, it becomes less electrically conductive, thus preventing deeper penetration of the current.
- Used for endobronchial lesions.
- YAG laser provides deeper tissue penetration (5–10 vs. 2–3 mm).
- APC - allows homogeneous tissue dessication because it continually seeks areas with higher water content.
Argon Plasma Coagulation (APC)

• Morice et al - 31 patients with hemoptysis and 25 patients with both airway obstruction and hemoptysis treated by endobronchial APC therapy
• Hemoptysis stopped in all patients

Morce RC  Chest 2001;119:781–787
Other modalities

• Cryotherapy – inoperable endoluminal malignancies
• Cryotherapy - freezing causes vasoconstriction and development of microthrombi in venules and capillaries,