


Anesthesia for Bronchoscopic Procedures: Clinical and Technical Perspectives



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Conflict of Interest Disclosure

- No active industry grants.
- No paid advisory positions.
- Have been provided with equipment for clinical evaluation by a number of manufacturers.
- Co-editor, text book on Anesthesia for Otolaryngology
- Will discuss off label use of meds.



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Objectives


At the end of this presentation the participant will be able to discuss:

- Hybrid ORs and modern bronchoscopy suites
- Therapeutic bronchoscopic procedures
- Advanced diagnostic bronchoscopic procedures, Endobronchial Ultrasound (EBUS), Electromagnetic Navigational Bronchoscopy (ENB)
- Anesthetic considerations for advanced diagnostic bronchoscopy
- Anesthetic management for therapeutic bronchoscopy

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Old Anesthesia Service at Bronchoscopy Suite

- Monitor
- Tram
- Battery
- Set of cables
- Portable BIS
- 2 Propofol infusion pumps
- Oral and nasal airways
- O2 cannula
- Emergency drugs
- GA induction drugs
- Laryngoscope with MAC 4
- Two different sizes ET tubes
- Clip board, Anesthesia record
- #2 of different sizes syringes
- Topicalization equipment
- LMA




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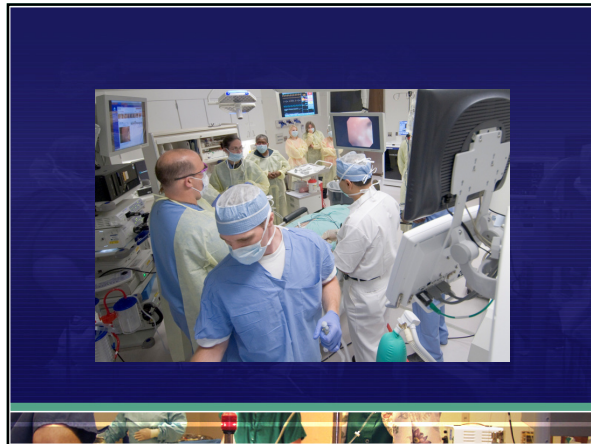
The New Bronchoscopic Surgery Center

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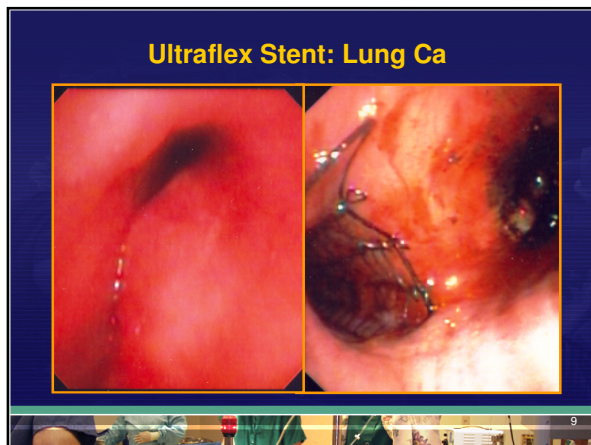
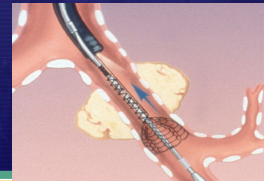
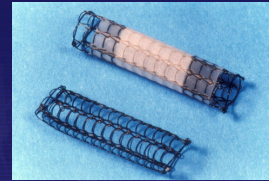


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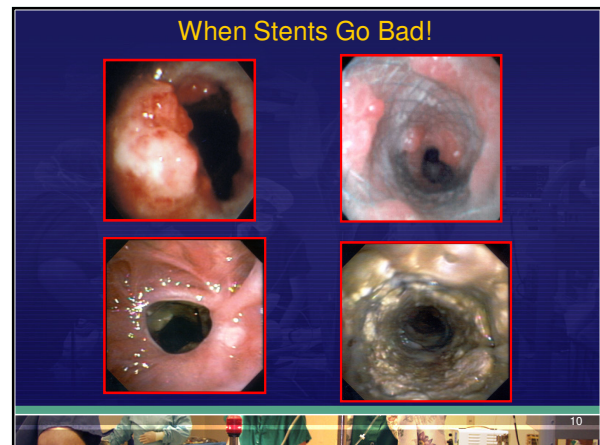


STENTS

- Prosthesis supporting a hollow tubular structure
- Charles R. Stent, DDS (19th century, England)
- Stent ~ Prosthesis (Artificial)
Coronary, Esophageal, Vascular
Biliary, Endobronchial etc.
- Self expanding metallic stents (SEMS)



Ultraflex Stent: Lung Ca



When Stents Go Bad!

Journal of Clinical Anesthesia (2009) 23, 124–125
Elsevier
Special article

Anesthesia and airway management for removing pulmonary self-expanding metallic stents^{1,2}
B. Jahn-Singhe MD, PhD, FRCP (Professor and Staff)^{1,2,3,4}, Basem Abdelmalak MD (Staff)^{1,2},
Michael MacIsaac MD (Staff)¹, Thomas R. Claba MD (Staff)²

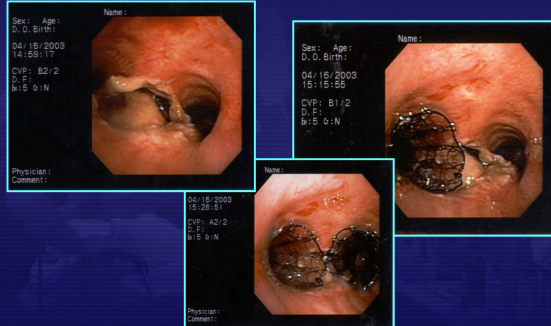
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- Retained stent pieces
- Mucosal tears with or without bleeding
- Re-obstruction requiring new stent placement
- Pneumothorax
- Damage to the pulmonary artery, and death
- Unwanted permanent incorporation of retained fragments in the tissue
- CPB may need to be instituted urgently in complicated cases

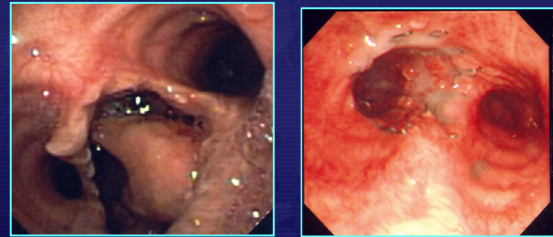


Stent Removal Products

Bilateral Bronchial Stents



Before & After 1 year



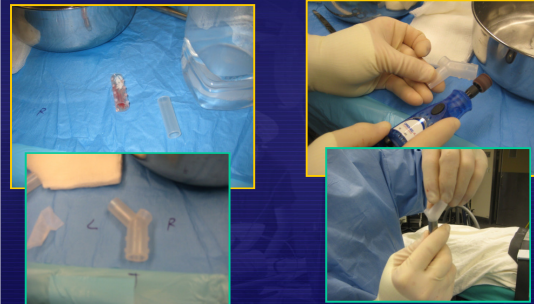
SEMS: Future

- Newer designs
- Radiation emitting stents
- Bio-absorbable stents
- Custom home-made stents

..... Way of the future!

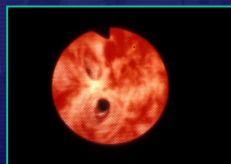
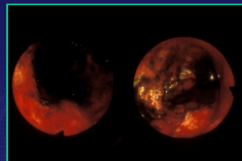
Saito Yukihito, Minami Ken-ichiro, Kaneda Hiroyuki et al., New Tubular Bioabsorbable Knitted Airway Stent: Feasibility Assessment for Delivery and Deployment I A Dog Model Ann Thorac Surg 2004; 78:1439-1440

Silicon Stents



Nd:YAG Laser

- Could be delivered via flexible bronchoscope
- High energy, deep penetration
- Delayed complications
- Laser fire
- Avoid N₂O
- Keep FiO₂ < 0.4
- Saline filled ETT cuff

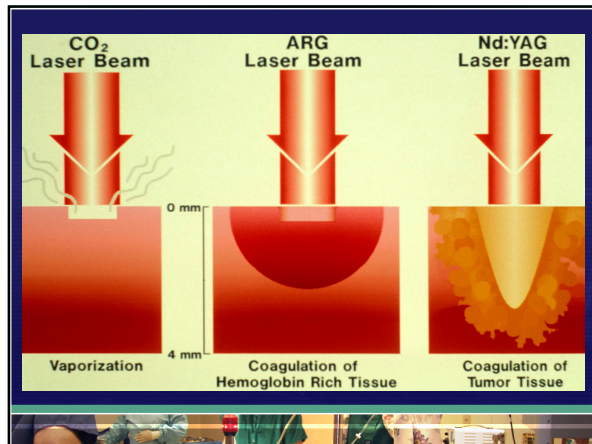


Laser Delayed Complications

Respiratory Arrest After Successful Neodymium:Yttrium-Aluminum-Garnet Laser Treatment of Subglottic Tracheal Stenosis

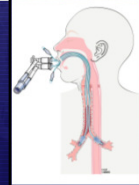
Basem Abdelmalak, MD*, J. Victor Ryckman, MD*, Sawzan AlHaddad, MD*, and Juraj Sprung, MD, PhD†

*Department of General Anesthesiology, The Cleveland Clinic Foundation, Cleveland, Ohio; and †Department of Anesthesiology, Mayo Medical School; Department of Anesthesiology, Mayo Clinic, Rochester, Minnesota



Balloon Dilation

- An effective palliative procedure for airway narrowing
- Under direct vision using FOB or rigid bronchoscope
- Physical dilation can be very stimulating
- GA is recommended



New Procedures

- EndoBronchial UltraSound (EBUS) needle aspiration
- Complete EBUS mediastinal staging
- Electromagnetic Navigational Bronchoscopy (ENB)

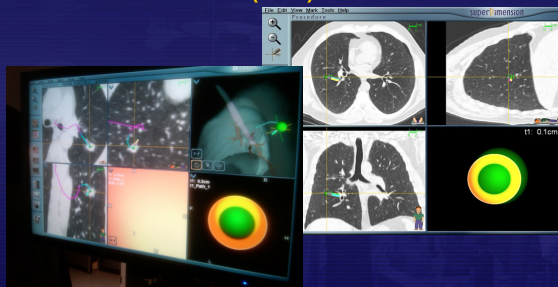
EBUS Mediastinal Staging

- Requires fluoroscopy
- Endobronchial US
- Transtracheal aspirational biopsy



Abdelmalak B, Sarkiss M. Anesthesia for Advanced Diagnostic Bronchoscopic Procedures, in "Anesthesia for Otolaryngologic Surgery, CUP 2013 pp 297-309

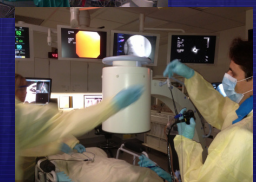
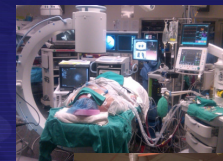
Electromagnetic Navigational Bronchoscopy (ENB)



Abdelmalak B, Sarkiss M. Anesthesia for Advanced Diagnostic Bronchoscopic Procedures, in "Anesthesia for Otolaryngologic Surgery, Abdelmalak B, Doyle DJ. Eds. CUP 2013 pp 297-309

Configuration for Electromagnetic Navigation

- Bronchoscopy
- SuperDimension
- EBUS
- Fluoroscopy



Abdelmalak B, Gildes T, Doyle J. Anesthesia For Bronchoscopy, Current Pharmaceutical Design, 2012, 18, 6314-6324

Special Considerations for ENB

- Avoid ferromagnetic objects
- Special OR table

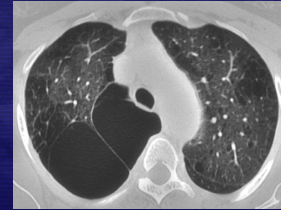


Abdelmalak B, Gildea T, Doyle J. Anesthesia For Bronchoscopy. Current Pharmaceutical Design, 2012, 18, 6314-6324

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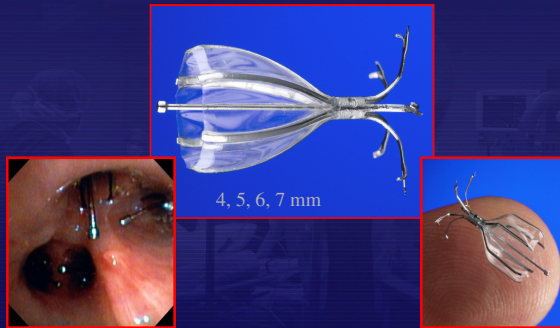
Bronchoscopic Lung Volume Reduction

- Alternative to open lung volume reduction surgery
- Intrabronchial one way valve, allows for one way exit of air and mucus.



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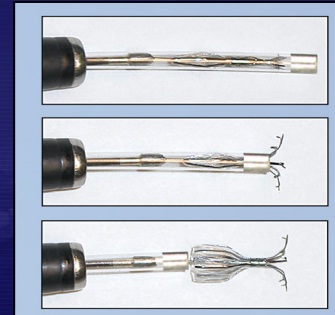
Spiration® IBV System



4, 5, 6, 7 mm

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IBV Placement



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Anesthetic Considerations and Techniques For Advanced Diagnostic and Therapeutic Bronchoscopy

6314

Current Pharmaceutical Design, 2012, 18, 6314-6324

Anesthesia for Bronchoscopy

Basem B. Abdelmalak¹, Thomas R. Gildea² and D. John Doyle¹

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Pre-operative Evaluation

- Airway evaluation, symptoms of compromise
- Size of the lesion or tumor, its location and extent
- Prior chemotherapy and its effects on vital organs (especially heart and lungs)

Abdelmalak B. Anesthesia for Interventional Pulmonology. In: Urban R GW, Philip B, editor. Anesthesia Outside of the Operating Room. New York, NY, USA: Oxford University Press; 2011. p. 167-74.

Pre-operative Evaluation Contd.

- Commonly associated conditions:
 - Heavy tobacco smoking
 - Alcohol use
- Common co-morbidities:
 - CAD
 - Chronic obstructive/restrictive pulmonary disease,
 - Malnutrition
 - Aspiration pneumonitis

Abdelmalak B. Anesthesia for Interventional Pulmonology. In: Urban R GW, Philip B, editor. Anesthesia Outside of the Operating Room. New York, NY, USA: Oxford University Press; 2011. p. 167-74.

Anesthesia: Premedication

- Should only be considered for a very anxious patient
- Patients should never be medicated and left alone
- Judicious use of sedatives is warranted with small titrated doses

Abdelmalak B. Anesthesia for Interventional Pulmonology. In: Urban R GW, Philip B, editor. Anesthesia Outside of the Operating Room. New York, NY, USA: Oxford University Press; 2011. p. 167-74.

Anesthesia: Intraoperative

- Topical anesthesia and sedation could be used for some of these procedures
- GA is required for most of these surgeries
- TIVA might be a better technique
- Muscle relaxation is recommended

Abdelmalak B, Gildea T, Doyle J. Anesthesia For Bronchoscopy. Current Pharmaceutical Design, 2012, 18, 6314-6324.

Options for Anesthetics and Adjuvants

- Inhalation anesthetics
- **Propofol infusion**
- Propofol + remifentanyl or alfentanil
- Midazolam and Fentanyl
- Ketamine
- Dexmedetomidine
- Fospropofol

Abdelmalak B, Gildea T, Doyle J. Anesthesia For Bronchoscopy. Current Pharmaceutical Design, 2012, 18, 6314-6324.

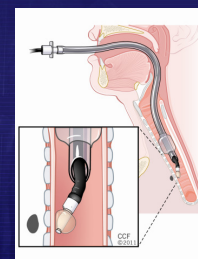
Total Intravenous Anesthesia (TIVA)

- Avoid polluting the room with inhaled anesthetic agents
- Ensures continuous delivery of anesthesia despite possible ventilation leaks
- Allows for utilization of intermittent apnea or jet ventilation techniques

Doyle J, Abdelmalak B, Machuzak M, Gildea T. Anesthesia and Airway Management for Removing Pulmonary Self-expanding Metallic Stents. J Clin Anesth. 2009 Nov;21(7):529-32.

Choice of The Airway

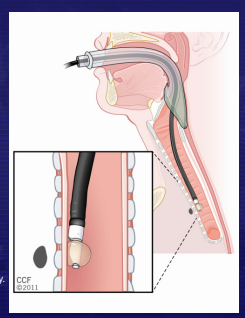
- Lower tracheal and bronchial lesions and /or defects:
 - Use as large of a tube as possible to allow room for the bronchoscope and ventilation



Abdelmalak B, Gildea T, Doyle J. Anesthesia For Bronchoscopy. Current Pharmaceutical Design, 2012, 18, 6314-6324.

Choice of The Airway

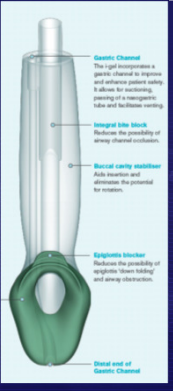
- Sub-glottic and upper tracheal lesions: SGA



Abdelmalak B, Gildes T, Doyle J. Anesthesia For Bronchoscopy. Current Pharmaceutical Design, 2012; 18, 6314-6324

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I-Gel



<http://www.i-gel.com/lib/docs/brochures/igelposter.pdf>

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Simultaneous Ventilation

- Use a fiberoptic swivel connector to allow Continuous ventilation to avoid circuit disconnect during bronchoscopy



Abdelmalak B, Gildes T, Doyle J. Anesthesia For Bronchoscopy. Current Pharmaceutical Design, 2012; 18, 6314-6324

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Ventilating Rigid Bronchoscope



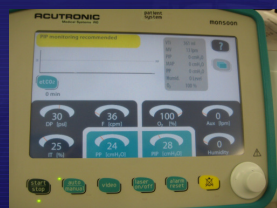
Abdelmalak B, Sarkiss M: Anesthesia for Therapeutic Bronchoscopic Procedures. In: Anesthesia for Otolaryngologic Surgery, 2nd edn. Edited by Abdelmalak B, Doyle DJ eds., London, UK: Cambridge University Press, 2013: In Press.

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Intermittent Apnea



Jet Ventilation



Jet Ventilation Equipment

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The Use of Muscle Relaxation

- Facilitates LMA/ETT insertion
- Makes insertion of the rigid laryngoscope for suspension laryngoscopy, and of the rigid bronchoscope much easier and safer
- Improves overall lung compliance by eliminating the chest wall component
- Provides a motionless patient
 - Advantageous when unexpected patient movement can result in grave consequences

Abdelmalak B. Anesthesia Care for Interventional Pulmonology, in "The text book of clinical anesthesia procedures outside the operating room" editors: Richard Urman, Beverly Phillip, and Wendy Gross, Oxford University Press

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Fluid Management in Bronchoscopic Surgery

- It is wise to restrict all administered fluids to the minimum needed for these patients
- Many present with a very limited lung reserve; and pulmonary congestion may aggravate their condition
- Concerns over concomitant cardiac disease, such as left-sided or right-sided heart failure, which may have been a complication of their long standing lung pathophysiology (cor pulmonale).

Abdelmalak B, Sarkiss M. Anesthesia for Advanced Diagnostic Bronchoscopic Procedures, In: Abdelmalak B and Doyle DJ eds. Anesthesia for Otolaryngologic Surgery, London, UK, Cambridge University Press, Chapter 30, P.297-308

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Management of the FiO₂

- Administering 100 % fraction of inspired oxygen (FiO₂) is very common
- It is usually necessary to maintain it at the lowest tolerable level, that is, below 40%, during treatment with Nd:YAG lasers or EBES
- If patients cannot tolerate lower oxygen levels, or suboptimal ventilation, it may become necessary to defer treatment temporarily, and ventilate with higher oxygen concentrations

Abdelmalak B. Anesthesia Care for Interventional Pulmonology, in "The text book of clinical anesthesia procedures outside the operating room" editors: Richard Urman, Beverly Phillip, and Wendy Gross, publisher:Oxford University Press

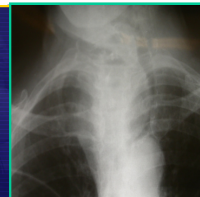
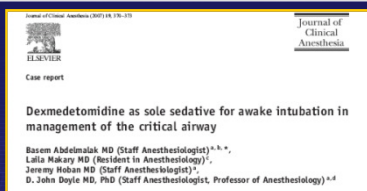
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The Use of Steroids in Bronchoscopic Surgery

- Airway edema
 - Cases where the flexible fiberoptic bronchoscope (alone or through an LMA and in the absence of ETT), has been inserted into and removed from the airway several times, rubbing against the vocal cords
 - A rigid bronchoscope has been used for a prolonged duration to avoid residual vocal cords' swelling post-operatively
 - Extensive tracheo-bronchial tissue trauma is caused by a prolonged procedure
- However, evidence of its real advantage is controversial at best

Abdelmalak B, Gildes T, Doyle J. Anesthesia For Bronchoscopy, Current Pharmaceutical Design, 2012, 18, 6314-6324.

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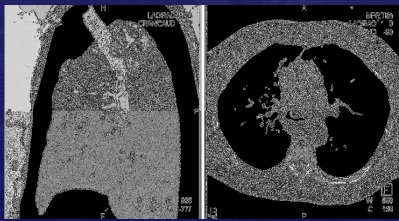
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J. Anesth.
DOI: 10.1007/s00550-010-0494-6

CLINICAL REPORT

Dexmedetomidine for anesthetic management of anterior mediastinal mass


Basem Abdelmalak · Nicholas Marcanthony ·
Joseph Abdelmalak · Michael S. Machuzak ·
Thomas R. Gileta · D. John Doyle



Abdelmalak B, Marcanthony N, Abdelmalak J, Machuzak M, Gileta T, Doyle J. Dexmedetomidine for Anesthetic Management of Anterior Mediastinal Mass. J Anesth. 2010 Aug;24(4):607-10.

Summary

- Bronchoscopic surgery is evolving
- Anesthesiologists need to stay up-to date with the new procedures as we share the airway with the Pulmonologists
- Flexibility is needed to tailor and modify old anesthetic techniques and develop new ones to meet the new needs
- Effective communications and team work are essential for successful management of these challenging cases



Cleveland Clinic

Every life deserves world class care.

Thank you for your attention
Basem Abdelmalak, MD
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