

Introduction

The fiberopticbronchoscope introduced by Ikeda, has become a versatile tool in pulmonary medicine and has gained wide acceptance over the recent years because its advantages of superior visualization,ease of application compared to rigid bronchoscope(**Weinberger and Drazen, 2005**).

Lidocaine is the most widely used substance as at topical anesthetic in the respiratory tree during bronchoscopy, the maximum dose of lidocaine during bronchoscopy should be limited to 8.2 mg per kg of body weight, with the total dosage any way not exceeding 600mg(**Langmack and Martin, 2000**).

The appearance of hypoxemia is a fairly frequent phenomenon in the course of a bronchoscopy (**Dubrwsky et al., 1975**).

Cardiovascular complications are well known to occur during fiberoptic bronchoscopy as a result of premedication, topical anesthetic and the hypoxemia engendered during the procedure (**Davis et al., 1997**).

Direct tracheal stimulation is the primary cause of cardiovascular response during bronchoscopy(**Xue et al., 2006**).

The cardiovascular changes are of little consequence in patients with normal cardiovascular function but in patients with pre-existing hypertension, coronary heart disease or in elderly patients with accompanying lung disease (*Credle et al., 1974*).

References

AARC clinical practice guideline. Bronchoscopy assisting – 2007 revision and update. *Respir Care* 2007; 52: 74–80.

AbalArca J, Parente I, Almazán RL. Lung cancer and COPD: a common combination. *Arch Bronconeumol* 2009; 45: 502-7.

Agostini C, Zambello R, Trentin L, et al: Prognostic significance of the evaluation of bronchoalveolar lavage cell populations in patients with HIV-1 infection and pulmonary involvement. *Chest* 1991; 100:1601-1606

Ahmad, M., et al., The safety of outpatient transbronchial biopsy. *CHEST*, 1986. 90(3): p. 403-5.

AlkaChandra ,Jayant N , Banavaliker and Manoj. Fiberoptic bronchoscopy without sedation. Intrascricoid injection better than the “spray as you go” technique . *Indian J Anaesth.* 2011, 55(5):483-487).

Albertini RE , Harrel JH , Kuribara N , Moser KM. Arterial hypoxemia induced by fiberoptic bronchoscopy. *JAMA* 1974; 230:1666-1667).

Aldrich TK, Prezant DJ: Adverse effect of drugs on respiratory muscles . *Clin .Chest Med* 1990, 11:177-189)

Ameer, B., M.B. Burlingame, and E.M. Harman, Systemic absorption of topical lidocaine in elderly and young adults undergoing bronchoscopy. *PHARMACOTHERAPY*, 1989. 9(2): p. 74-81.

References

- Antonelli, M.,Pennisi M A,Conti G et al.**,Fiberoptic bronchoscopy during noninvasive positive pressure ventilation delivered by helmet. INTENSIVE CARE MEDICINE, 2003. 29(1): p. 126-9.
- Antoniades, N. and C. Worsnop**, Topical lidocaine through the bronchoscope reduces cough rate during bronchoscopy. Respiriology, 2009. 14(6): p. 873-6.
- Arai, T., HataanoY ,Komatsu K ,et al.** Real-time analysis of the change in arterial oxygen tension during endotracheal suction with a fiberoptic bronchoscope. CRITICAL CARE MEDICINE, 1985. 13(10): p. 855-8.
- Arunabh, Ross Mayeroff, et al.** Conservative management of tracheal rupture after endotracheal intubation. J Bronchol 2004; 11: 22-26
- Aslam M, Beg M:** Desirability of using buprenorphine and diazepam as an adjunct to atropine in patients undergoing fibroptic bronchoscopy. J.Pak.Med.Assoc 43. (6):120-122.1993;
- Atkins JPJ:** Bronchology: The Philadelphia legacy. J Bronchol 1996; 3:328-330.
- Attaran, D.,Towhidi M ,et al.**The relationship between peak expiratory flow rate before bronchoscopy and arterial oxygen desaturation during bronchoscopy. ACTA MEDICA IRANICA, 2008. 46 (2): p. 95-98.
- Bajwa M, Henein S, Kamholz S:** Fiberoptic bronchoscopy in the presence of space-occupying intracranial lesions. Chest 1993; 104:101-103. **Bakhtawar I, Schaefer RF, Salian N:** Utility of Wang needle aspi-

References

ration in the diagnosis of actinomycosis. Chest 2001; 119:1966-1968.

Banerjee AK, Rabbitts PH, George J: Lung cancer 3. Fluorescence bronchoscopy: clinical dilemmas and research opportunities. Thorax 2003; 58:266-271.

Barnes TW, Afessa B, Swanson KL, Lim KG: The clinical utility of flexible bronchoscopy in the evaluation of chronic cough. Chest 2004; 126:268-272.

Barst RJ: Medical therapy of pulmonary hypertension. An overview of treatment and goals. Clin Chest Med 2001; 22: 509–515, ix.

Bauer TT, Torres A, Ewig S, et al. Effects of bronchoalveolar lavage volume on arterial oxygenation in mechanically ventilated patients with pneumonia. Intensive Care Med 2001; 27: 384-93.

Beamis JF: Rigid bronchoscopy. In Beamis JF, Mathur PN (eds): Interventional Pulmonology. New York: McGraw-Hill, 1999.

Bechara, R., Beamis J, Simoff M, Mathur P. Practice and complications of flexible bronchoscopy with biopsy procedures. Journal of Bronchology, 2005. 12 (3): p. 139-142.

Becker HD: Gustav Killian: A biographical sketch. J Bronchol 1995 ; 2:77-83.

Bein T, Pfeifer M, Keyl C, Metz C, Taeger K: Right ventricular function and plasma atrial natriuretic peptide levels during fiberbronchoscopic al-

veolar lavage in critically ill, mechanically ventilated patients. *Chest* 1995; 108: 1030–1035.

Beller TA, Mitchell DM, Sobonya RE, et al: Large airway obstruction secondary to endobronchial coccidioidomycosis. *Am Rev Respir Dis* 1979; 120:939-942.

Benowitz NL, Gowlay SG. Cardiovascular toxicity of nicotine :implications for nicotine replacement therapy .*J Am Coll Cardiol* .1997;29 :1422-1431.

Birring SS, Brightling CE, Symon FA, et al: Idiopathic chronic cough: Association with organ specific autoimmune disease and bronchoalveolar lymphocytosis. *Thorax* 2003; 58:1066-1070

Birring SS, Murphy AC, Scullion JE, et al: Idiopathic chronic cough and organ-specific autoimmune diseases: A case-control study. *Respir Med* 2004; 98:242-246.

Bjortaff O, Brosstad F, Boe J. Bronchoscopy with transbronchial biopsies. measurement of bleeding volume and evaluation of the predictive value of coagulation test .*Eur Respir J* 1998;12:1025-7.

Booton R, Jacob BK: Varicosities of the valleculae: An unusual cause of hemoptysis?. *Chest* 2002; 121:291-292.

British Thoracic Society guideline for advanced diagnostic and therapeutic flexible bronchoscopy in adults
BTS guidelines *THORAX* 2011;66 iii1eiii21

British Thoracic Society Bronchoscopy Guidelines Committee, a Subcommittee of Standards of Care

Committee of British Thoracic Society. British Thoracic Society guidelines on diagnostic flexible bronchoscopy. Thorax 2001; 56 Suppl 1: i1-21.

British Thoracic Society Bronchoscopy FOR DIAGNOSTIC FLEXIBLE BRONCHOSCOPY IN ADULTS 2012.

Broaddus C, Dake MD, Stulbarg MS, et al: Bronchoalveolar lavage and transbronchial biopsy for the diagnosis of pulmonary infections in the acquired immunodeficiency syndrome. Ann Intern Med 1985; 102:747-752.

Bugmann P, Birraux J, Barrazone C, et al: Severe bronchial synechia after removal of a long-standing bronchial foreign body: A case report to support control bronchoscopy. J Pediatr Surg 2003; 38:E14.

Bulpa PA, Dive AM, Mertens L e al. Combined bronchoalveolar lavage and transbronchial lung biopsy: safety and yield in ventilated patients. Eur Respir J 2003; 21: 383-4.

Busse WW, Wanner A, Adams K, et al. Investigative bronchoprovocation and bronchoscopy in airway diseases. Am J Respir Crit Care Med 2005; 172:807-816.

Carmosino MJ, Friesen RH, Doran A, Ivy DD: Perioperative complications in children with pulmonary hypertension undergoing noncardiac surgery or cardiac catheterization. Anesth Analg 2007; 104: 521-527

Cetinkaya E, Yildiz P, Altin S, et al: Diagnostic value of transbronchial needle aspiration by Wang 22-gauge

References

cytology needle in intrathoracic lymphadenopathy. *Chest* 2004; 125:527-531.

Chhajed PN, Wallner J, Stolz D, Baty F, Strobel W, Brutsche MH, Tamm M: Sedative drug requirements during flexible bronchoscopy. *Respiration* 2005; 72: 617–621.

Chastre J, Fagon J. VAP: State of the art. *Am J Respir Crit Care Med* 2002; 165: 867-903.

Chastre J, Fagon J-Y: Ventilator-associated pneumonia. *Am J Respir Crit Care Med* 2002; 165:867-903.

Cheng S-L, Chang H-T, Lau H-P, et al: Pulmonary alveolar proteinosis: Treatment by bronchofiberscopic lobar lavage. *Chest* 2002; 122:1480-1485.

Chhajed PN, Glanville AR. Management of hypoxemia during flexible bronchoscopy. *Clin Chest Med* 2003; 24: 511–516.

Chhajed PN, Heuss LT, Tamm M. Cutaneous carbon dioxide tension monitoring in adults. *Curr Opin Anaesthesiol* 2004; 17: 521–525.

Chhajed PN, Kaegi B, Rajasekaran R, Tamm M. Detection of hypoventilation during thoracoscopy: combined cutaneous carbon dioxide tension and oximetry monitoring with a new digital sensor. *Chest* 2005; 127: 585–588.

Choi TK, Siu KF, Lam KH, et al: Bronchoscopy and carcinoma of the esophagus I: Findings of bronchoscopy in carcinoma of the esophagus. *Am J Surg* 1984; 147:757-759.

References

Chou C-W, Lin F-C, Tung S-M, et al: Diagnosis of pulmonary alveolar proteinosis: Usefulness of Papanicolaou-stained smears of bronchoalveolar lavage fluid. Arch Intern Med 2001; 161:562-566.

Chung HS, Lee JH: Bronchoscopic assessment of the evolution of endobronchial tuberculosis. Chest 2000; 117:385-392.

Clark, G., et al, Titrated sedation with propofol or midazolam for flexible bronchoscopy: a randomised trial. EUROPEAN RESPIRATORY JOURNAL, 2009. 34(6): p. 1277-83.

Clements P, Milman N: Bilateral pulmonary abscesses caused by Streptococcus pyogenes: Diagnostic importance of fiberoptic bronchoscopy. Scand J Infect Dis 1994; 26:755-757.

Collard HR, King Jr TE: Demystifying idiopathic interstitial pneumonia. Arch Intern Med 2003; 163:17-29.

Colt HG, Prakash UBS, Offord KP: Bronchoscopy in North America: Survey by the American Association for Bronchology, 1999. J Bronchol 2000; 7:8-25.

Colt, H.G. and T. Matsuo, Hospital charges attributable to bronchoscopy-related complications in outpatients. RESPIRATION, 2001. 68(1): p. 67-72

Conde MB, Soares SL, Mello FC, et al: Comparison of sputum induction with fiberoptic bronchoscopy in the diagnosis of tuberculosis: Experience at an acquired immune deficiency syndrome reference center in Rio de

References

Janeiro, Brazil. *Am J Respir Crit Care Med* 2000; 162:2238-2240.

Cordasco, E.M., Jr., A.C. Mehta, and M. Ahmad, Bronchoscopically induced bleeding. A summary of nine years' Cleveland clinic experience and review of the literature. *CHEST*, 1991. 100(4): p. 1141-7.

Credle WF, Smiddy JF, Elliot RC. Complications of fiberoptic bronchoscopy, *AM Rev Resp Dis* 1974;109:67-72.

Cropp AJ, DiMarco AF, Lankerani M: False-positive transbronchial needle aspiration in bronchogenic carcinoma. *Chest* 1984; 85:696-697.

Cullinane M, G.A., Hargraves CMK, Lucas S, Schubert M, Sherry KM, et al, Scoping our practice. National Confidential Enquiry into Patient Outcome and Death (NCEPOD); 2004 Oct.

Cuvas O, Er A, Ikeda OC, Dikmen B, Basar H. Cigarette smoking and the haemodynamic response to tracheal intubation. *Anaesthesia*. 2008;63:463-466.

Datta D, Onyirimba F, McNamee MJ: The utility of chest radiographs following percutaneous dilatational tracheostomy *Chest* 2003; 123:1603-1606.

Davies, L., Mister R, Spence DP, et al., Cardiovascular consequences of fiberoptic bronchoscopy. *EUROPEAN RESPIRATORY JOURNAL*, 1997. 10(3): p. 695-8.

Davies SF, Sarosi GA: Epidemiological and clinical features of pulmonary blastomycosis. *Semin Respir Infect* 1997; 12:206-218.

References

De Lassence A, Fleury-Feith J, Escudier E, et al: Alveolar hemorrhage: Diagnostic criteria and results in 194 immunocompromised hosts. *Am J Respir Crit Care Med* 1995; 151:157-163.

De Padua, A.I., et al., Clonidine as a pre-anesthetic agent for flexible bronchoscopy. *RESPIRATORY MEDICINE*, 2004. 98(8): p. 746-51.

De, S., Assessment of patient satisfaction and lidocaine requirement during flexible bronchoscopy without sedation. *Journal of Bronchology*, 2009. 16 (3): p. 176-179.

Diaz-Fuentes, G., et al., Requirement of sedation during flexible bronchoscopy among substance and nonsubstance users. *Journal of Bronchology*, 2006. 13 (2): p. 58-60.

Diette GB, Wiener CM, White P Jr. The higher risk of bleeding in lung transplant recipients from bronchoscopy is independent of traditional bleeding risks: results of a prospective cohort study. *Chest* 1999; 115: 397-402

D'Ippolito, R., et al., Indications for flexible fiberoptic bronchoscopy and its safety in the very elderly. *MONALDI ARCHIVES FOR CHEST DISEASE*, 2007. 67(1): p. 23-9.

DiTomasso JP, Ampel NM, Sobonya RE, et al: Bronchoscopic diagnosis of pulmonary coccidioidomycosis: Comparison of cytology, culture, and transbronchial biopsy. *Diagn Microbiol Infect Dis* 1994; 18:83-87

References

Djukanovic R, Wilson JW, Lai CK, et al. The safety aspects of fiberoptic bronchoscopy, bronchoalveolar lavage, and endobronchial biopsies in asthma. *Am Rev Respir Dis* 1991; 143: 772-7.

Dreher, M., et al., Sedation during flexible bronchoscopy in patients with pre-existing respiratory failure: Midazolam versus Midazolam plus Alfentanil. *RESPIRATION*, 2010. 79(4): p. 307-14.

DubrwskyC ,Awe RJ ,Jenkins DE, The effect of bronchofiberscopic examination on oxygenation status . *Chest* 1975 ;137-140.

Dweik, R.A., et al., Analysis of the safety of bronchoscopy after recent acute myocardial infarction. *CHEST*, 1996. 110(3): p. 825-8.

Efthimiou, J., et al., Plasma concentrations of lignocaine during fibreoptic bronchoscopy. *THORAX*, 1982. 37(1): p. 68-71.

Elston WJ, Whittaker AJ, Khan LN, et al. Safety of research bronchoscopy, biopsy and bronchoalveolar lavage in asthma. *EurRespir J* 2004; 24: 375-7.

Enrique Diaz-Guzman SonaliVadi Omar A. Minai Thomas R. GildeaAtul C. Meht. *Respiration* 2009;77:292–297

Ernst, A., et al., Effect of Routine Clopidogrel Use on Bleeding Complications AfterTransbronchial Biopsy in Humans*. *CHEST*, 2006. 129(3): p. 734-737.

Evans EN, Ganeshalingam K, Ebden P. Changes in oxygen saturation and transcutaneous carbon dioxide

References

and oxygen levels in patients undergoing fiberoptic bronchoscopy. *Respir Med* 1998; 92: 739–74.

Excellence, N.I.f.H.a.C., Prophylaxis against infective endocarditis (CG64). London: National Institute for Health and Clinical Excellence., 2008.

Facciolongo, N.,Palcilli M ,Gasparini S , et al., Incidence of complications in bronchoscopy.Multicentre prospective study of 20,986 bronchoscopies.MONALDI ARCHIVES FOR CHEST DISEASE, 2009. 71(1): p. 8-14.

Fagon J, Chastre L. Invasive and non-invasive strategies for management of suspected ventilator-associated pneumonia. A randomised trial. *Ann Intern Med* 2000; 132: 621-630.

Fang WF , Chen Yc , Chung YH , Woon WT, Tseng CC, Chang HW ,Lin MC.Predictors of oxygen desaturation in patients undergoing diagnostic bronchoscopy.*Chang Gung Med J* .2006.29(3):306-312.

Fang, W.-F., Chen Y-C, ChungY-H, et al., Predictors of oxygen desaturation in patients undergoing diagnostic bronchoscopy.*Chang Gung Medical Journal*, 2006. 29(3): p. 306-12.

Feinsilver S, Fein A, Niederman M, et al: Utility of fiberoptic bronchoscopy in nonresolving pneumonia. *Chest* 1990; 98:1322-1326.

Feinstein MB, Mokhtari M, Ferreira R, et al: Fiberoptic bronchoscopy in allogeneic bone marrow transplantation: Findings in the era of serum cytomega-

References

lovirus antigen surveillance. *Chest* 2001; 120:1094-1100.

Finer NN, Muzyka D: Flexible endoscopic intubation of the neonate. *PediatrPulmonol* 1992; 12:48-51.

Fox, B.D., et al., Benzodiazepine and opioid sedation attenuate the sympathetic response to fiberoptic bronchoscopy. Prophylactic labetalol gave no additional benefit. Results of a randomized double-blind placebo-controlled study. *RESPIRATORY MEDICINE*, 2008. 102(7): p. 978-83.

Freitag L, Firusian N, Stamatis G, et al: The role of bronchoscopy in pulmonary complications due to mustard gas inhalation. *Chest* 1991; 100:1436-1441.

Freitag L, Tekolf E, Stamatis G, et al: Three years experience with a new balloon catheter for the management of haemoptysis. *EurRespir J* 1994; 7:2033-2037.

Fry WA: Techniques of topical anesthesia for bronchoscopy. *Chest* 73. (suppl 5): 694-696.1978;

Frey, W.C., E.E. Emmons, and M.J. Morris, Safety of high dose lidocaine in flexible bronchoscopy. *Journal of Bronchology*, 2008. 15 (1): p. 33-37.

Fu ES, Downs JB, Schweiger JW, Miguel RV, Smith RA. Supplemental oxygen impairs detection of hypoventilation by pulse oximetry. *Chest* 2004; 126: 1552–1558

Gaugler C, Donato L, Rivera S, et al: Intramural bronchogenic cyst in the carina observed in a neonate and treated by needle aspiration: A case report. *J Perinatol* 2004; 24:317-318.

References

Glazer M, Nusair S, Breuer R, et al: The role of BAL in the diagnosis of pulmonary mucormycosis. *Chest* 2000; 117:279-282.

Gong Jr H, Salvatierra C: Clinical efficacy of early and delayed fiberoptic bronchoscopy in patients with hemoptysis. *Am Rev Respir Dis* 1981; 124:221-225.

Gonzalez R, De-La-Rosa-Ramirez I, Maldonado-Hernandez A, et al: Should patients undergoing a bronchoscopy be sedated?. *Acta Anaesthesiol Scand* 2003; 47:411-415.

Gorge JN, Shattil SJ. The clinical importance of acquired abnormalities of platelet function. *N Engl J Med* 1991; 324: 27-39.

Greig JH, Cooper SM, Kasimbazi HJN, et al. Sedation for fiberoptic bronchoscopy. *Respir Med* 1995; 89:53-5.

Hammer DL, Aranda CP, Galati V, et al: Massive intrabronchial aspiration of contents of pulmonary abscess after fiberoptic bronchoscopy. *Chest* 1978; 74:306-307.

Hasmoni, M.H., et al., Randomized-controlled Trial to Study the Equivalence of 1% Versus 2% Lignocaine in Cough Suppression and Satisfaction During Bronchoscopy. *Journal of Bronchology & Interventional Pulmonology*, 2008. 15(2): p. 78-82 .

Hassan G et al. *Lung India* 2005;22:54-59.

Hassan G, Khan G Q, Yassen M, Masood T, Wasseen Qureshi. Cardiac arrhythmias during fiberoptic bronchoscopy and relation with oxygen saturation *Lung india* 2005;22:54-59.
