CHAPTER 2

PEROPERATIVE EVALUATION IN COPD PATIENTS

Betül İkbal DOĞAN [1]
Ceyda ANAR [2]

Chronic obstructive pulmonary disease (COPD) is characterized by persistent respiratory symptoms and progressive airflow limitation caused by repeated inhalation of noxious particles or gases [1]. Chronic obstructive pulmonary disease (COPD) with chronic shortness of breath, cough and sputum is a common comorbidity in patients undergoing surgical procedures [2]. COPD occurs in middle and elderly people and generally in smokers. On the other hand, in adult patients without a diagnosis of COPD and asthma, increased length of hospital stay and decreased pulmonary function tests (PFT) were found due to smoking and respiratory symptoms [3]. In previous studies, patients who underwent major surgical procedures had to use a forced and prolonged mechanical ventilator in the postoperative period. it has been demonstrated that COPD is an independent risk factor in mortality due to the need for support and the development of ventilator-associated pneumonia [4-7]. The presence of comorbidities such as lung cancer, pulmonary hypertension, obesity, obstructive sleep apnea (Overlap syndrome) together with COPD increases the risk of complications and mortality related to surgical procedures [8-11]. It is recommended that elective surgical procedures be delayed during acute exacerbations of COPD. It has been reported that the use of antibiotics together with systemic corticosteroids in the early period provides better postoperative results [12-13].

In patients with COPD, the risks of general anesthesia increase more in thoracic surgical procedures. Surgical procedures with single lung ventilation, lateral decubitus position, open pneumothorax are the reasons for the increase of these risks. Single lung ventilation application during the operation is performed for reasons such as lung resection surgeries, thoracoscopy, esophagus and thoracic aorta operations, infection and hemorrhage limited to one lung, hypoxemia due to single lung disease, tracheobronchial damage, bronchopleural fistula, large cyst or bulla of the lung. Double lumen tube, bronchial blocker and single lumen endobronchial tubes are used for this procedure. Since single lung ventilation will cause insufficient use of lung capacity and increase the risk of perioperative complications, patients with COPD should be evaluated and followed more carefully.

[1] MD., Izmir Katip Celebi University, School Of Medicine, Department Of Internal Medicine, Department Of Thoracic Diseases betuldoğan1993@hotmail.com
[2] Doç. Dr., Izmir Katip Celebi University, School Of Medicine, Department Of Internal Medicine, Department Of Thoracic Diseases drceydaanar@hotmail.com

less irritant agent such as sevoflurane. Lung transplantation and in volume reduction surgery, total intravenous anesthesia may be preferred to inhalation agents [41]. Non-invasive mechanical ventilation application to the high-risk patient after the operation can reduce the work of breathing. Non-invasive ventilation should be avoided in patients with excessive secretion and when airway reflexes are lost [2].

VOLUME REDUCING SURGERY SURGERY PREOPERATIVE EVALUATION FOR AND ANESTHESIA APPROACH

Since COPD patients undergoing bullectomy have a limited respiratory reserve, they are at risk of hypoxemia, hypercarbia and pneumothorax in the perioperative period due to insufficient ventilation of the lung and structural disorders. If there is a bulla in the lung that is ventilated during the operation, the risks increase further. In addition, postoperative mechanical ventilation support may be required when general anesthesia is required for the operation. If the bulge or air cyst is connected with the bronchus, the air gap may be enlarged by positive pressure ventilation. In this case, a significant part of the tidal volume enters the bulla area, alveolar dead space increases, and if the minute volume is not increased at the same rate, hypoventilation occurs.

Although the connection of the bulbs with the bronchial system is poor, the use of nitrous oxide, which expands the closed spaces, should be avoided. In addition, another issue that should be considered is that there may be air increase in the cavity due to a possible "checkvalve" system between the bulla and the airway. In this case, the positive pressure created within the bulla may cause the bulla to burst and pneumothorax. It has been shown that high frequency ventilation applications with low tidal volume are effective in preventing bulla ruptures due to positive pressure.

High frequency ventilation techniques should be used with caution as they can generate high PEEP [42]. Dynamic hyperinflation or pneumothorax should be considered in the event of a sudden deterioration of the hemodynamic state. In addition, it should be kept in mind that patients with emphysema have limited exercise capacity, are elderly patients with a long-term smoking history and risk of coronary artery disease.

Postoperative air leak is an important risk due to lung parenchymal damage, suture line and opening of adjacent lung tissues in COPD patients.Therefore, two main goals are to awaken patients quickly from anesthesia and to provide early extubation.For this, short-acting anesthetic agents should be used, appropriate monitoring, postoperative pain control should be provided, the body temperature of the patient should be kept at normal values. Care should be taken to keep the hemodynamic values in a stable condition and adequate parenteral fluid support should be provided.Ensuring that emphysema patients who are candidates for lung transplantation or volume reduction surgery are fed in an appropriate and sufficient time, is an important part of rehabilitation programs to combat malnutrition [43].

Surgery should be postponed in cases where medical treatment of COPD is insufficient, in the presence of upper respiratory tract infection and acute exacerbation of COPD.Corticosteroids, bronchodilators, prophylactic antibiotics and treatments for deep vein thrombosis prophylaxis administered in the pre-anesthesia period reduce postoperative complications. It has been reported that pre-operative pulmonary rehabilitation increases exercise capacity and accelerates recovery.

REFRENCES

1. GOLD.Global Strategy for the Diagnosis, Management and Prevention of COPD.2020.
2. Edrich T, Sadovnikoff N. Anesthesia for patients with sever chronic obstructive pulmonary disease. CurrOpinAnaesthesiol 2010; 23: 18-24.
3. Marco R, Accordini S, Anto` JM, et al. Long-term outcomes in mild/ moderate chronic obstructive pulmonary diseas in the European community respiratory health survey. Am J RespirCrit Care Med 2009; 180: 956-63.

4. Spieth PM, Güldner A, de Abreu MG. Chronic obstructive pulmonary disease. CurrOpinAnaesthesiol 2012; 25: 24-9.
5. Makris D, Desrousseaux B, Zakynthinos E, DurocherA, et al. Theimpact of COPD on ICU mortality in patients with ventilator-associated pneumonia. Respir Med 2011; 105: 1022-9.
6. Greenblatt DY, Kelly KJ, Rajamanickam V, et al. Preoperative factors predict perioperative morbidity and mortality after pancreatico duo denectomy. Ann SurgOncol 2011; 18: 2126-35.
7. Penuelas O, Frutos-Vivar F, Ferna´ndez C,Anzueto A, et al. Characteristic and outcomes of ventilated patients according to time to liberation from mechanical ventilation. Am J RespirCrit Care Med 2011; 184: 430-7.
8. Raviv S, Hawkins KA, DeCamp MM, Kalhan R. Lung cancer in chronic obstructive pulmonary disease: Enhancing surgical options and outcomes. Am J RespirCrit Care Med 2011; 183: 1138-46.
9. Cuttica MJ, Kalhan R, Shlobin OA, Shahzad Ahmad, et al. Categorization and impact of pulmonary hypertension in patients with advanced COPD. Respir Med 2010; 104: 1877-82.
10. Marin JM, Soriano JB, Carrizo SJ,Ana Boldova, Bartolome R Celli. . Outcomes in patients with chronic obstructive pulmonary disease and obstructive sleep apnea: The overlap syndrome. Am J RespirCrit Care Med 2010; 182: 325-31.
11. Hutagalung R, Marques J, Kobylka K,ZeidanM, et al. The obesity paradox in surgical intensive care unit patients. Inten Care Med 2011; 37: 1793-9.
12. Rothberg MB, Pekow PS, Lahti M, Brody O, et al. Antibiotic therapy and treatment failure in patients hospitalized for acute exacerbations of chronic obstructive pulmonary disease. JAMA 2010; 303: 2035-42.
13. Lindenauer PK, Pekow PS, Lahti MC, Lee J, et al. Association of corticosteroid dose and route of administration with risk of treatment failure in acute exacerbation of chronic obstructive pulmonary disease. JAMA 2010; 303: 2359-67.
14. Wong DH, Weber EC, Schell MJ,Wong AB et al. Factors associated with postoperative pulmonary complications in patients with severe chronic obstructive pulmonary disease. AnesthAnalg 1995; 80: 276-84.
15. Maddali MM. Chronic obstructive lung disease: Perioperative management. Middle East J Anesthesiol 2008; 19: 1219-39.
16. Licker M, Schweizer A, Ellenberger C,TschoppJM, et al. Perioperative medical management of patients with COPD. Int J Chron Obstruct Pulmon Dis 2007; 2: 493-515.
17. Brunelli A, Kim AW, Berger KI, Addrizzo-Harris DJ. Physiologic evaluation of the patient with lung cancer being considered for resectional surgery: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. Chest 2013; 143:e166S.
18. Brunelli A, Charloux A, Bolliger CT, et al. ERS/ESTS clinical guidelines on fitness for radical therapy in lung cancer patients (surgery and chemo-radiotherapy). EurRespir J 2009; 34:17.
19. British Thoracic Society, Society of Cardiothoracic Surgeons of Great Britain and Ireland Working Party. BTS guidelines: guidelines on the selection of patients with lung cancer for surgery. Thorax 2001; 56:89.
20. Ferguson MK, Little L, Rizzo L, Popovich KJ, et al. Diffusing capacity predicts morbidity and mortality after pulmonary resection. J ThoracCardiovascSurg 1988; 96:894.
21. Ferguson MK, Vigneswaran WT. Diffusing capacity predicts morbidity after lung resection in patients without obstructive lung disease. Ann ThoracSurg 2008; 85:1158.
22. Liptay MJ, Basu S, Hoaglin MC, Freedman N,et al. Diffusion lung capacity for carbon monoxide (DLCO) is an independent prognostic factor for long-term survival after curative lung resection for cancer. J SurgOncol 2009; 100:703.
23. Tisi GM. Preoperative evaluation of pulmonary function. Validity, indications, and benefits. Am Rev Respir Dis 1979; 119:293.
24. Dunn WF, Scanlon PD. Preoperative pulmonary function testing for patients with lung cancer. Mayo ClinProc 1993; 68:371.
25. Kearney DJ, Lee TH, Reilly JJ, M MDeCamp, D J Sugarbaker. Assessment of operative risk in patients undergoing lung resection. Importance of predicted pulmonary function. Chest 1994; 105:753.
26. Marshall MC, Olsen GN. The physiologic evaluation of the lung resection candidate. Clin Chest Med 1993; 14:305.
27. Datta D, Lahiri B. Preoperative evaluation of patients undergoing lung resection surgery. Chest 2003; 123:2096.
28. Colice GL, Shafazand S, Griffin JP, Robert Keenan, et al. Physiologic evaluation of the patient with lung cancer being considered for resectional surgery: ACCP evidenced-based clinical practice guidelines (2nd edition). Chest 2007; 132:161S.
29. Markos J, Mullan BP, Hillman DR,Musk AW, et al. Preoperative assessment as a predictor of mortality and morbidity after lung resection. Am Rev Respir Dis 1989; 139:902.
30. Beckles MA, Spiro SG, Colice GL, et al. The physiologic evaluation of patients with lung cancer being considered for resectional surgery. Chest 2003; 123:105S.
31. Boujibar F, Gillibert A, Gravier FE,Gillot T, et al. Performance at stair-climbing test is associated with postoperative complications after lung resection: a systematic review and meta-analysis. Thorax 2020; 75:791.
32. Ribas J, Díaz O, Barberà JA,M Mateu, et al. Invasive exercise testing in the evaluation of patients at high-risk for lung resection. EurRespir J 1998; 12:1429.

33. Gerald WM. Current concepts. Preoperative pulmonary evaluation. N Engl J Med 1999; 340: 937-44.
34. . Berry CE, Wise RA. Mortality in COPD: Causes, risk factors, and prevention. COPD 2010; 7: 375-82.
35. Nakagawa M, Tanaka H, Tsukuma H, Kishi Y. Relationship between the duration of the preoperative smoke-free period and the incidence of postoperative pulmonary complications after pulmonary surgery. Chest 2001; 120: 705-10.
36. Fukuse T, Satoda N, Hijiya K, Fujinaga T. Importance of a comprehensive geriatric assessment in prediction of complications following thoracic surgery in elderly patients. Chest 2005; 127: 886-91.
37. Dreger H, Schaumann B, Gromann T, et al. Fast-track pulmonary conditioning before urgent cardiac surgery in patients within sufficiently treated chronic obstructive pulmonary disease. J CardiovascSurg (Torino) 2011; 52: 587-91.
38. Burns KE, Adhikari NK, Keenan SP, Meade MO. Non-invasiv positive pressure ventilation as a weaning strategy for intubated adults with respiratory failure. Cochrane Database Syst Rev 2010. doi: 10.1002/14651858. CD004127.pub2.
39. Maddali MM. Chronic obstructive lung disease: Perioperative management. Middle East J Anesthesiol 2008; 19: 1219-39.
40. Satoh JI, Yamakage M, Kobayashi T,N Tohse et al. Desflurane but not sevoflurane can increase lung resistance via tachykinin pathways. Br J Anaesth 2009; 102: 704-13.
41. Purugganan RV. Intravenous anesthesia for thoracic procedures. CurrOpinAnaesthesiol 2008; 21: 1-7.
42. Conacher ID. Anaesthesia for the surgery of emphysema. Br J Anaesth 1997; 79: 530-8.
43. Brister NW, Barnette RE, Kim V, Keresztury M. Anesthetic considerations in candidates for lung volume reduction surgery.Proc Am ThoracSoc 2008; 5: 432-7.v