In patients with respiratory pathology changes in respiratory physiology may lead to clinical problems during the conduct of anesthesia and the perioperative period. An understanding of the disease processes that can affect the lungs and pleura allows the anesthesiologist to account for the potential complications of these conditions and manage the anesthetic accordingly.

This article describes the initial evaluation of a patient with respiratory problems. A thorough medical history, physical examination and some functional tests are the keys in decision-making in preparation for anesthesia and surgery. The burden of respiratory disease is reviewed, and some important areas of current interest are highlighted.

Key words: preoperative preparation; anesthesia; respiratory disease; restrictive; infection

INTRODUCTION

Patients with a disease of respiratory system are at increased risk of perioperative pulmonary complications.

While the operations in the upper abdomen are associated with 20-40% risk of pulmonary complications in postoperative period, lower abdominal operations carry the risk of only 2-5%. The reason for this lies in the decreased functional residual capacity (FRC) and tidal volume (Vt) after upper abdominal and thoracic operations. Patient is unable to cough for some time following the operation. Sputum retention may lead to atelectasis and/or infection. Also, diaphragmatic movements are restricted, so the vital capacity is decreases for about 50%, even in previously healthy individuals.

In order to prevent postoperative pulmonary complications, it is necessary to identify respiratory disorders, and to optimize the patient’s condition. Also, for the prevention of these complications it is important to conduct a series of postoperative measures: adequate analgesia, early mobilization and physical therapy. Certain cases may require pulmonology consultation.

INFLUENCE OF ANESTHESIA ON PULMONARY FUNCTION

During introduction FRC is decreased by 15-20%, because muscle relaxation moves diaphragm cranially, and thoracic wall towards inside. In morbidly obese it may be decreased by up to 50%. FRC remains the same only if ketamine anesthesia is used. Also, airways are closed easier and at earlier stages in smokers, elderly, and in patients with respiratory disorders.

Atelectasis may be found in dependent lung areas by CT in approximately 80% of patients. This leads to shunting of about 10% of the pulmonary blood flow through the areas with low ventilation/perfusion (V/Q) ratio. Intubation may halve the dead space volume.

Even in concentrations of inhalational anesthetics as low as 0.1 MAC, response to hypercapnia is decreased, and the response to hypoxia and acidosis is virtually lost. All these disturbances are even more pronounced in patients with respiratory disorders. Although they usually disappear quickly in minor surgery patients, they could last for several days after major operations.

PREOPERATIVE PREDICTION OF POSTOPERATIVE PULMONARY COMPLICATIONS

If a respiratory disorder is diagnosed preoperatively, the steps should be taken to decreased likelihood of the complications. If the operation is not carried out in thoracic or abdominal cavity, even severe respiratory conditions are associated with low risk level.

Independent predictors of pulmonary complications are pathologic findings on physical examination or chest X-ray (CXR). However, absence of these findings does not
exclude severe respiratory pathology which may come up only during anesthesia (e.g. sarcoidosis).

Previously, it was considered that the preoperative spirometry is necessary to evaluate the patients with respiratory disorders and to predict the risk of pulmonary complications. However, new evidence indicates that preoperative spirometry could not be used to evaluate the individual risk and that it should not be used as a sole base to decide if a patient may safely undergo a non-thoracic surgery.

Predictors of the perioperative pulmonary complications are:
- scoring systems which evaluate the overall comorbidity (ASA status, Goldman Cardiac Risk Index, Charleston Comorbidity Risk)
- older age (> 60 yrs)
- smoking for more than 8 weeks
- previous malignancy
- symptoms of chronic bronchitis
- BMI > 27kg/m²
- operations in the upper abdomen or thorax
- pathologic findings on PE/CXR
- PaCO₂ > 6kPa (45mmHg)
- cognitive disorders
- postoperative NGT

Preoperative assessment of respiratory function should be based on history, physical examination, and pulmonary function tests (peak flow rate, flow/volume curve, diffusion capacity), arterial blood gases (ABGs), CXR, and chest CT.

**History**

It should be inquired about any previous hospitalizations due to respiratory problems, especially if it involved ICU. Intensity of respiratory disturbances frequently fluctuates, so the patient him/herself may be the best source to determine the current phase of his/her disorder. The treatment response of the particular person should also be determined. Elective surgery is allowed only after the patient is in the optimal state.

Smoking history should be acquired, including both the length and the amount. It is known that tobacco smoke contains about 43 cancerogens. Also, carboxyhemoglobin concentration increases, so oxygen carrying capacity is decreased. Long term smoking causes numerous respiratory problems. Mucus is secreted in increased amounts, and its elimination is less efficient. Smokers develop respiratory complications more often than non-smokers. If a patient quits smoking 8 weeks before the operation, the complication risk decreases to the level of non-smokers.

The qualities of cough and sputum should be assessed, and the patient should be encouraged to quit smoking. It should also be inquired if the symptoms are relieved by bronchodilators and corticosteroids.

Also, respiratory symptoms that could be associated with heart disease should be elicited and further evaluated (orthopnea, paroxysmal nocturnal dyspnea). Roizen’s classification of dyspnea:

Grade O - No dyspnea while walking on the level at normal pace
Grade I - "I am able to walk as far as I like provided I take my time"
Grade II - Specific street block limitation."I have to stop for a while after one or two blocks"
Grade III - Dyspnea on mild exertion."I have to stop and rest going from the kitchen to the bathroom"
Grade IV - Dyspnea at rest

**Physical examination**

Local findings point to increased possibility of complications after abdominal operations. In the setting of respiratory disorder, possible cardiac complications should be considered (right heart failure).

Fiberoptic bronchoscope completely replaced rigid bronchoscopy in the examination of airways for visualization and tissue sample collection for culture, cytology or pathohistology.

Mediastinoscopy, if needed, is performed under general anesthesia. Possible mediastinoscopy complications are pneumothorax, mediastinal hemorrhage, air embolism, recurrent laryngeal nerve injury, and compression of the brachiocephalic trunk, with loss of pulse in the right arm and compromising of the right carotid artery blood flow.

There is a correlation between exercise tolerance and pulmonary function tests, which may also give information about the state of cardiovascular system.

**Pulmonary function tests**

Peak flow rate is a useful test in chronic obstructive pulmonary (COPD) and asthma. Peak flow meter could be used at the bedside (the best of 3 consecutive readings is recorded). Cough is considered to be ineffective with PEF <200L/min.

Spirometry is used to determine severity of the respiratory disorders, and to differentiate between obstructive and restrictive disorders. Usually, forced vital capacity is measured, as well as forced expiratory volume in 1st second. The FEV1/FVC ratio is considered normal if above 70%.

The evidence has appeared, lately, that spirometry does not contribute to prediction of pulmonary complications, even in the presence of COPD. Therefore, it is not always necessary to delay surgery, even if spirometry results are very unfavorable. FEV1<1000 mL indicates inability of efficient cough and possible retention of the secretions, and the patient is probably going to require respiratory support after a major surgery.

Spirometry could be of use in two groups of patients:
- Patients with unclear diagnosis, unfavorable clinical or CXR findings.
- when lower extremity weakness prevents appropriate functional capability

Spirometry also presents part of the work up in pulmonary resection patients. If it indicates obstructive pattern, (low FEV1/FVC ratio), it should be determined if the findings improve after albuterol application. If possible,
spirometry should be repeated after a 7 day course of steroids (prednisolone 20-40mg/day).

Flow volume curve is used to evaluate airway obstruction due to either external (e.g. enlarged thyroid gland) or internal causes (bronchospasm). Peak flow values are measured with different lung volumes.

Diffusion capacity is determined by breathing the mixture consisting of 0.3% CO and 10% Helium in 20s. Normal values are between 17-25mL/min/mmHg. Alveolar-capillary diffusion is decreased in various pulmonary conditions.

Arterial blood gases (ABG) should be determined in all patients complaining of fatigue and should be compared with previous results, if available. PaCO2>6.0kPa (45mmHg) in rest indicates inadequate ventilation and predicts respiratory complications.

One component of the ABGs is PaO2, and if it is <8kPa (60mmHg) in spite of supplemental O2 application and in the absence of a right-to-left shunt, it indicates acute respiratory failure.

Acute respiratory failure is accompanied by abrupt increase in pCO2 and a decrease in pH. In chronic respiratory failure, pH is sustained at the levels between 7.35 and 7.45 in spite of the PaCO2 increase, due to renal compensation.

CXR is necessary in every patient with signs or symptoms of a respiratory disorder. Pathologic findings on upright PA CXR indicate increased risk of pulmonary complications.

Chest CT is needed in patients with lung bulae. It may demonstrate anterior or posterior pneumothorax, as well as interstitial lung disease that could not be detected on CXR. Helical CT may show pulmonary embolism or aortic dissection.

RESPIRATORY INFECTIONS AND ELECTIVE SURGERY

The most common infection is viral or bacterial infection of nasopharynx. Non-infectious nasopharyngitis usually occurs due to allergy or vasomotor causes.

Patients with a respiratory infection, fever and cough regardless of the auscultatory findings should not undergo elective surgery under general anesthesia due to increased risk of pulmonary complications. These complications increase morbidity and mortality, and increase treatment length and expenses.

Symptoms include sneezing, runny nose, sometimes fever, purulent nasal secretion, productive cough and malaise. Physical exam may reveal tachypnea, wheezing, or intoxication.

Adults with common cold do not have increased risk of postoperative respiratory disturbances, unless they have previous respiratory condition or undergo major abdominal or thoracic surgery.

Due to anatomical and physiological differences, children with symptoms of recent upper respiratory tract infection frequently develop hypoxemia (SaO2<93%)9. This is particularly important if intubation is required.

Possible development of complications is also indicated by copious secretions, congestion, data about prematurity, smoking in parents, etc. Majority of authors recommends delay of an elective surgery for 4-6 weeks, especially in the presence of fever, airway hyperreactivity or intoxication10.

In case of a surgical emergency, patient should receive adequate hydration, in order to decrease secretions quantity. Usage of laryngeal mask decreases airway irritation and risk of bronchospasm.

Postoperatively, these patients may develop laryngeal spasm, bronchospasm, postintubation croup, desaturation, and atelecasis.

BRONCHIECTASIES

Bronchiectasis could develop due to an inherited condition (e.g. cystic fibrosis) or due to the destruction of the lower airway epithelium in childhood (usually caused by bacteria or mycobacteria). It is characterized by irreversible dilation of bronchi due to destruction of bronchial wall by inflammation.

This chronic condition is characterized by prolonged productive cough, lasting for years, with purulent sputum, and occasionally by massive hemoptysis. Massive hemoptysis (>200ml/24h) is treated by resection or bronchial artery embolization.

They are frequently accompanied by symptoms of asthma due to prolonged inflammatory changes in the airways.11 The obstructive pattern could also develop due to bronchiectasis. Pulmonary function may float between normal, to both obstructive and restrictive changes.

These patients should be brought to the optimal condition before major surgery, because their cough and respiratory function will be decreased in the postoperative period.

Due to the damaged mucociliary activity and mucus retention in the dilated airways, these patients are at increased risk of infection. If a bacterial infection develops, it is hard to treat. P. aeruginosa is a common cause of these infections, and it may persist for years, but cause symptom exacerbation only occasionally.

The most important components of the treatment are physical therapy, adequate antibiotics, and control of the asthma symptoms.

Preoperative

Prior to elective surgery the patient should be in best possible condition. Therefore, the patient’s pulmonologist should be included in the preparations for surgery.

Preoperatively, sputum sample should be sent for culture. Sometimes, it is necessary to hospitalize the patients for 3-10 days and treat them with IV antibiotics and physical therapy (postural drainage). Prior to a major surgery, IV antibiotics are started upon admission. While expecting culture results, it may be presumed that P. aeruginosa is involved, and combination of gentamycin and ceftazidime, or imipenem plus gentamycin should be administered.
Nebulized bronchodilators may also be included. In case of previous prolonged steroid treatment, dose should be increased by 5-10 mg/day. However, if more respiratory symptoms are present than usual, surgery should be postponed.

**Tests**

Sputum bacteriology should be requested, and with severe conditions, spirometry should be performed and ABGs taken.

**CYSTIS FIBROSIS**

The disease is caused by mutations on chromosome 7, resulting in disturbed transport of chloride in the epithelium of airways, pancreatic ducts, liver, GIT, and reproductive organs. Perioperative complications in cystic fibrosis are mainly respiratory, and they develop in 10% of patients.

The patients are dehydrated, with viscous secretions, obstructed lumen, and finally destruction and scarring of the various exocrine gland ducts.

Chronic sinusitis is present, and about 50% of patients have nasal polyps (polypectomy is the main cause for anesthesia in these patients), as well as respiratory, cardiovascular, and gastrointestinal symptoms. Pancreatic failure with diabetes develops, as well as hepatobiliary tract obstruction and azoospermia. Due to the lack of pancreatic secretions, malabsorption occurs. Meconium ileus is found in neonates with this disease.

The most common cause of morbidity and mortality are chronic respiratory infections.

Airway occlusion, atelectasis and frequent P. aeruginosa infections take place. Cough, chronic production of purulent sputum and dyspnea are present. Secretions are viscous due to the presence of neutrophils and long fibrils of DNA released from them, and application of recombinant human DNAase may be of some benefit. Bronchoalveolar lavage fluid has high neutrophil count, which is a sign of inflammation. In virtually all adults with CF, COPD is present.

**Preoperative**

Active infection should be identified. Clinical signs may be unreliable.

**Tests**

Sweat chloride concentration above >80mEq/L together with symptoms described above, confirm the diagnosis of CF. On CXR, bulae and pneumothorax should be sought. CT may demonstrate abundant bulae, as well as anterior pneumothorax. FEV1 is a prognosis indicator.

**RESTRICTIVE PULMONARY DISEASES**

These diseases (acute and chronic) could be divided in two groups: intrinsic pulmonary restrictive diseases and restrictive disorders with an extrapulmonary cause.

**Acute intrinsic pulmonary restrictive diseases**

**Acute lung edema**

Develops due to increased capillary pressure (cardiogenic lung edema) or to increased capillary permeability. CXR finding of parahilar edema (butterfly wings) are more commonly encountered in cardiogenic pulmonary edema.

In cardiogenic edema symptoms (dyspnea, tachypnea, hypertension, and tachycardia) are more pronounced than in edema due to increased capillary permeability. In non-cardiogenic causes, edema fluid contains increased amount of protein. Acute respiratory distress syndrome alveoli are diffusely damaged.

**Aspiration pneumonia**

Aspiration of the acidic stomach content leads to the destruction of surfactant-producing cells and capillary endothelium. Atelectasis forms and edema fluid collects due to increased capillary permeability. Clinical presentation is similar to ARDS, with hypoxia, tachypnea, and both bronchospasm and pulmonary hypertension may be present.

CXR shows the changes 6-12 hours after the event, usually in the right lower lobe. Measuring alveolar lavage fluid pH is not of much significance, since the aspirated fluid is usually quickly distributed to the peripheral parts.

The condition is treated by supplemental oxygen and PEEP. Bronchodilators might be used. There is no evidence of any benefit from antibiotics in the literature, although this kind of pneumonia is frequently accompanied by a bacterial infection. Opinions are divided in regard to corticosteroids. There is no proof of benefit, although certain authors use large doses of methylprednisolone and dexamethasone.

**Neurogenic pulmonary edema**

It develops in a small group of patients, minutes to hours after a head injury. It may also present in postoperative period. It is explained by the increased sympathetic activity by injured central nervous system, which leads to generalized vasoconstriction and distribution of a larger proportion of the circulatory volume to the lungs. Increased capillary pressure causes transudation into the interstitium and alveoli. Pulmonary hypertension and hypervolemia may damage the pulmonary blood vessels. Treatment includes intracranial pressure control, oxygenation and ventilation. Diuretic administration is not advised, unless hypervolemia is present.
**Drug-induced pulmonary edema**

Opioids and cocaine may cause acute non-cardiogenic lung edema. High concentrations of protein in the edema fluid indicate that the cause of the edema is increased capillary permeability. Cocaine causes vasoconstriction, myocardial ischemia, and myocardial infarction. Treatment includes intubation and mechanical ventilation.

**Lung edema in high altitude sickness**

Usually develops after 48-72 hrs on altitudes between 2500-5000 m above sea level. It is thought to be caused by pulmonary vasoconstriction and subsidiary increased pressure in the pulmonary circulation. It is treated by oxygenation and by moving to a lower altitude. NO administration may be of some benefit.

**Reexpansion of a collapsed lung**

Quick reexpansion of a collapsed lung may cause edema inside it. Risk is increased if more than 1L of content is evacuated from pleural cavity (either air in pneumothorax or effusion fluid), and if the collapse persisted for more than 24 hrs, or the lung is reexpanded too quickly. Treatment is symptomatic.

**Pulmonary edema due to negative pressure**

It develops after the elimination of an acute obstruction of the airway due to laryngeal spasm, epiglottitis, tumor, obesity, hiccup, or obstructive sleep apnea. It usually occurs in several minutes to 3 hr after the obstruction is relieved. It results from the inspiratory effort to relieve the obstruction. Highly negative intrapleural pressure decreases interstitial hydrostatic pressure, and both venous return and preload are increased. Sympathetic nervous system is activated, which results in hypertension and circulatory volume centralization. All these factors lead to an increase in transcapillary pressure gradient and acute lung edema.

Symptoms include tachypnea, cough, and inability to keep saturation above 95%. It may mimic both aspiration pneumonia and pulmonary embolism. Radiographic changes disappear in 12-24 hr. Treatment is symptomatic.

**Chronic intrinsic restrictive pulmonary diseases**

**Parenchymal lung diseases**

In these diseases, lung compliance is decreased, and gas exchange is disturbed. Early inflammatory reaction in the alveolar wall interferes with gas exchange. This phase is followed by collagen deposition and fibrosis, with airway narrowing and reduced ability to dilate. Pulmonary hypertension and cor pulmonale follow.

Causes of pulmonary fibrosis include autoimmune diseases (rheumatoid arthritis, systemic sclerosis, sarcoidosis), exposure to dusts (asbestosis), allergies (feathers, farmer’s lungs), various substances taken systemically (amiodarone, chemotherapy, certain toxins), and fibrosis as a consequence of ARDS.

Also, idiopathic pulmonary fibrosis, with no identifiable cause may develop. It may have a progressive course with respiratory failure in 3-8 years after first symptoms appear, with high mortality rate.

Other causes include eosinophilic granuloma (histiocytosis X), pulmonary alveolar proteinosis, lymphoid interstitial pneumonia and cryptogenic organizing pneumonia.

**Pulmonary infections rarely cause fibrosis.**

Treatment most commonly consists of oral steroids, but other immune suppressants may be used. In younger patients heart and lung transplant may be considered.

**Preoperatively**

Patients complain of a nonproductive cough and dyspnea. Signs of cor pulmonale might be present. Fine crackles may be found on auscultation. CXR findings include milk glass pattern or nodules. ABGs show hypoxia with normocapnia. VC is <$15mL/kg. Infections should be treated preoperatively, with clearance of secretions and smoking cessation.

**Sarcoidosis**

Sarcoidosis is a systemic disease characterized by granuloma formation in various tissues, which heal by fibrosis. It is speculated that it develops as a result of an abnormal response to several antigens. The disease may present at any age, but usually between the age of 20 and 40.

Pulmonary lesions are detected in 50% of patients. Pleural, peribronchial and alveolar granulomas are replaced by fibrous tissue. Hilar lymphadenopathy may lead to bronchial obstruction and distal atelectasis. Bronchial mucosa infiltration may lead to stenosis. Infiltration of the mucosa in nose, nasopharynx, tonsils, palate or larynx also occurs.

In about 20% of patients heart lesions are found: cor pulmonale due to pulmonary changes, myocardial or valvular vegetations are rare, and conduction disorders, ventricular tachycardia or sudden death may also occur.

Skin changes, uveitis/iritis and hypercalcemia may develop.

**Preoperatively**

The most significant lesions are those in heart and lungs, which could be severe or minimal. Steroid or immunosuppressant treatment should be noted, and their adverse effects appreciated.

**Tests**

Preoperative pulmonary function tests may reveal restrictive pattern. Diffusion capacity is decreased. ABGs are used to determine the level of hypoxia. ECG may show signs of right ventricle hypertrophy or arrhythmias. Hypercalcemia is sometimes detected.
RESTRICTIVE DISORDERS WITH AN EXTRAPULMONARY CAUSE

Thoracic wall disorders (kyphoscoliosis, ankylosing spondylitis, syringomyelia, spine and spinal cord tumors), severe obesity or abdominal pathology (ascites) which may cause elevation of the diaphragm and interfere with adequate ventilation. Circumferential burns with the development of contractures and poliomyelitis cause restrictive pattern of pulmonary disorders. Late pregnancy may also limit ventilatory movements.

Symptoms in kyphoscoliosis correlate with the degree of curvature. Some patients may be asymptomatic, while others develop respiratory failure and cor pulmonale. With curvature $>70$ degrees there is a risk of respiratory failure. Spinal curvature is increased by $15^\circ$ in every 20 years. When it reaches $100^\circ$, dyspnea develops, and with curvatures $>120^\circ$ alveolar hypoventilation and cor pulmonale develop.

Flail chest due to multiple fractures causes paradoxical respiratory movements. Treatment consists of mechanical ventilation until complete stabilization of the chest wall is achieved.

Pleural effusion and empyema are also extrapulmonary causes of restrictive disorders. Different pleural content (blood, pus, lipids, fluids) have identical radiographic appearance. Thoracocentesis is both a therapeutic and diagnostic procedure.

Pneumothorax is caused by the presence of gas in pleural cavity, which enters it through a tear in either visceral or parietal pleura. Symptoms include dyspnea, chest pain and cough. Hypoxia, hypotension, hypercapnia or tachycardia may be present. Treatment includes chest tube placement and oxygen supplementation. Tension pneumothorax occurs in about 2% of patients. It is treated by emergency thoracostomy in the second intercostal space, which could be lifesaving.

Mediastinal tumors may cause airway obstruction, decrease of lung volume, and compression on pulmonary artery, heart, or superior vena cava. This may further lead to hypoxia, hypotension, or cardiac arrest. During operation, spontaneous respirations should be maintained.

Mediastinitis after perforation of the esophagus or bacterial contamination is treated with antibiotics and drainage.

Pneumomediastinum results from injury to the esophagus, tracheobronchial tree, or alveolar rupture. It can occur spontaneously in some cases of cocaine use, but that kind of pneumomediastinum resolves spontaneously. Symptoms include retrosternal pain, dyspnea, and increased respiratory effort with the development of emphysema. It may progress to pneumothorax.

Bronchogenic cysts develop from primitive foregut, and are usually located in mediastinum or in the lung parenchyma. The ones found in the mediastinum are fluid-filled and may compromise the airway. With air-filled cysts, $N_2O$ administration should be avoided.

Preoperative

Pulmonology should be consulted. Adequate nutrition should be provided, but avoid overfeeding due to a possible increase in CO$_2$ production. Smoking cessation should be advised. The interesting fact is that respiratory symptom severity is not necessarily in proportion to the degree of airway compromise.

Majority of patients should be immunized against pneumococcus and influenza. Cardiac problems should be addressed. If supplemental oxygen is required, it should be adjusted on individual basis.

Tests

ABGs are usually maintained in normal range until late stage. Decreased PaO$_2$ is associated with severe condition, while CO$_2$ retention warns on the impending respiratory failure.

Spirometry should be performed. Volumes are decreased. Gas transfer should be tested if it has not been done during the last 6-8 years.

CXR changes are cause-dependent.

SLEEP APNEA SYNDROME

Sleep apnea syndrome is marked by the interruption of airflow through the nose and mouth lasting at least 10 s during sleep. These patients develop intermittent respiratory arrest and hypoxemia in the REM stage. Breathing starts due to hypoxic stimulus. It most commonly occurs in middle aged men, who complain of snoring with periods of apnea, disturbed sleep, fatigue and headaches.

Two types of apnea are identified (about 5% of patients belong to both types)\textsuperscript{16}:
- Obstructive (85%) results from upper airway obstruction
- Central (10%) is caused by intermittent breathing cessation

The state is diagnosed in specially equipped sleep laboratories where O$_2$ hemoglobin saturation and nasal airflow are measured. Additional tests include registering respiratory muscle movements, EEG and EMG (polysomnography).

Patient may develop pulmonary or systemic hypertensive, right ventricle hypertrophy, congestive heart failure, and respiratory failure with CO$_2$ retention. Majority of patients are treated with nasal CPAP while asleep.

In children, this syndrome may be related to adenoid or tonsilar hypertrophy, although obstruction severity does not correlate with adenoid or tonsilar size.

Patients with this syndrome may develop perioperative airway obstruction and respiratory failure while under the influence of sedatives.

Preoperative evaluation

History of daytime hypersomnolence should be elicited (falling asleep during daily activities, e.g. while reading or driving).
Patient’s partner should be inquired about sno-ring or periods of apnea during sleep, because the patient himself might be unaware of them. Obesity and collar circumference of >43cm are risk factors for this condition, which may respond to weight loss. Address associated conditions, like obstructive respiratory disease, hypertension and heart failure. Non-invasive CPAP should be provided in postoperative period.

Tests

If the patient is known to suffer from this syndrome, CBC should be ordered to evaluate for polycythemia, and ECG recorded to check for the signs of right ventricle strain. In 3% of children admitted for tonsiloadenectomy, ECG shows signs of right ventricle strain, which is an indication for echocardiography. ABGs should be taken.

CONCLUSION

Patients with compromised respiratory system should be critically evaluated before anesthesia introduction. The location, extent, and severity of the problem should be carefully assessed and the degree of respiratory dysfunction should be determined. Along with a routine physical examination, the evaluation should include any specific test (e.g., thoracic radiographs, bronchoscopy, arterial blood gases, etc.) necessary to fully define the extent of the pathology. Other systemic abnormalities (e.g., hydramet status, cardiovascular function, etc.) should also be assessed during the examination and should be corrected when possible.

SUMMARY

PREOPERATIVNA PRIPREMA BOLESNIKA SA INFEC-
TIVNIM I RESTRIKTIVNIM BOLESTIMA PLUČA KAO
KOMORBIDITETOM

Kod bolesnika sa respiratornom patologijom patofizi-
ološke promene respiratornog sistema mogu voditi klini-
čkim problemima tokom uvoda u anesteziju i u peri-
operativnom periodu. Razumevanje patoloških procesa u
plućima i pleuri obavezuje anestesiologa da ima u vidu
potencijalne komplikacije i da shodno tomu, napravi plan
anestesioloških postupaka. U članku se opisuje inicijalna
evaluacija bolesnika sa respiratornim problemima. Anam-
neza, fizikalni pregled i neki funkcionalni testovi pre-
dstavljaju polazu osnovu u donošenju odluka u pripremi
za anesteziju i operaciju. Osvetljena su neka važna po-
dručja respiratornih oboljenja od značaja za preoperativnu
pripremu.

Ključne reči: preoperativna priprema, anestezija,
respiratorno oboljenje, restriktivno, infekcija

REFERENCES

1. Hall JC, Tarala RA, Tapper J. Prevention of respira-
tory complications after abdominal surgery: a randomized
2. Zollinger A, Pasch T. The pulmonary risk patient. Bal-
lière’s Clinical Anesthesia; 1998; 5:391-400.
IH. Oxford Handbook of Anesthesia, Oxford Un Press 2nd ed. 2006; p.93-123
4. Nel MR, Morgan M. Smoking and anesthesia revis-
5. Hines RL, Marshall KE. Stoeltting2s Anesthesia and Co-
exisiting disease.5th ed Saunders, 2008; p.161-98.
6. Sladen RN, Coursin DB, Ketyler JT, Playford H. An-
7. Kalezić N, Ugrinović D. Anestezija i intenzivno
lečenje hirurških bolesnika, Medicinski fakultet, Kragu-
jevac, 2010; 7:155-84
8. Campbell NN. Respiratory tract infection and anes-
dečje anestezije, 2nd ed. 2005, p.93-121.
10. Simić DM. Značajne dečje sistemske bolesti. U: Simić
11. British Guideline on the Management on Asthma. A
12. Walsh TS, Young CH. Anesthesia and cystic fibro-
14. Ware LB. Matthay MA: Acute pulmonary edema. N
15. Boušhra NN. Anaesthetic management of patients
16. The National Lung and Blood Institute Acute Respi-
ratory Distress Syndrome Clinical Trials Network: Effi-
cacy and safety of corticosteroids for persistent acute res-