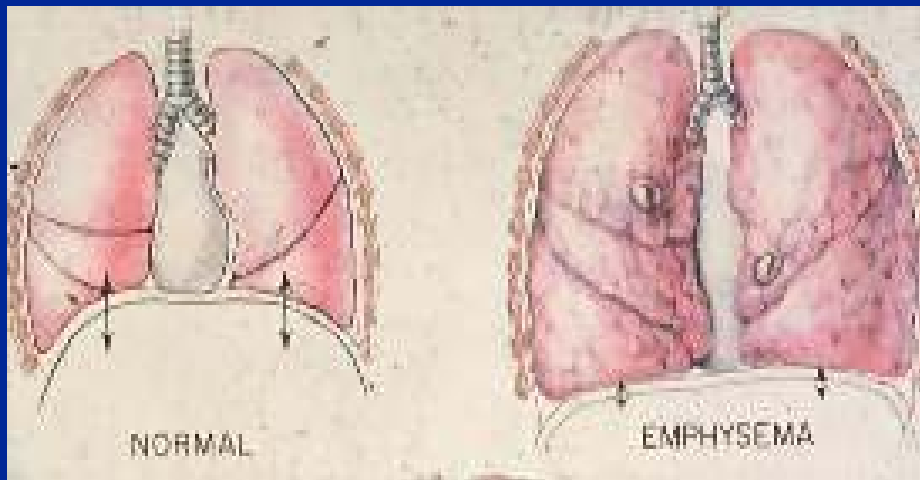


LUNG VOLUME REDUCTION SURGERY
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

What is emphysema?

Emphysema is a chronic disease of the lungs characterized by thinning and over-expansion of the lung-like blisters (bullae) in the lung tissue. Because carbon dioxide is trapped in the bullae, fresh air flowing into the lungs, demanded by the body, pushes the walls of the lung further out with each new breath. This lack of air transfer causes the lungs to expand, lose their elasticity and tissue becomes destroyed. This causes more carbon dioxide to remain in the lungs leaving less space for fresh air and causing shortness of breath. Over time the muscles and ribs surrounding the lungs are forced to stretch to fit the over-expanded lungs. The diaphragms, the major muscles used for breathing, become flattened and lose their ability to function.

Hyperinflation in Emphysema



What causes emphysema?

Cigarette smoking, air pollution, work hazards, and lung infections cause emphysema. Cigarette smoking is the most important of these factors. Cigarette smoking alters the structure and function of the lungs causing them to increase in size and lose their elasticity.

Cigarette smoking increases the number of inflammatory cells in your lungs. These cells release enzymes and other products that destroy the lung tissue. As a result, the lungs develop bullae (holes) and lose elasticity.

LUNG VOLUME REDUCTION SURGERY
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

Alpha-1 antitrypsin deficiency is a disease caused by a genetic defect that leads to decreased levels of the protective protein, alpha-1 antitrypsin. Alpha-1 antitrypsin protects the lungs from the destructive effects of enzymes called elastases. Patients with alpha-1 antitrypsin deficiency may develop emphysema at an early age.

How does emphysema cause shortness of breath?

This is a very complicated question. The destruction of lung tissue seen with emphysema eventually results in dysfunction of virtually all the functions of the lung, as well as that of the respiratory muscles and chest wall.

1. By losing elasticity, the lungs become more difficult to ventilate. The lungs rapidly become progressively more impaired and air becomes trapped within the lung. This is why emphysema is termed an “obstructive” lung disease. This impairment increases the work of breathing. Patients first experience symptoms with exercise but as the disease progresses shortness of breath can occur with all activities and even at rest.
2. In addition, as the lung loses its elasticity, the chest wall and ribs begin to expand and become overinflated. This results in a flattening of the major inspiratory muscle, the diaphragm, and causes the muscle to work less efficiently. This further adds to the increased work of breathing and diminishes the ability of the diaphragm to cope with even a normal workload. As a result, shortness of breath worsens.
3. The main function of the lungs is to add oxygen and remove carbon dioxide from the blood. As emphysema progresses, patients may have an inadequate amount of oxygen in the blood. As the disease worsens, the amount of carbon dioxide in the blood increases. If the oxygen in the blood is not supplemented, the entire body suffers, including the heart and the brain.
4. 4. The patient with emphysema becomes “out of shape” (deconditioned) because the disease does not allow sufficient exercise to stay in shape.

What is the medical treatment for patients who suffer from emphysema?

Medical treatment for emphysema includes bronchodilators, steroids, antibiotics, and oxygen. All patients with emphysema should stop smoking to prevent further damage to the lungs and airways. Air pollution and exposure to passive smoke should be avoided as much as possible. A regular exercise program should be maintained and usual activity such as walking and stair climbing continued. Emphysema patients should be vaccinated in the early fall with a flu vaccine. They should obtain prompt treatment of any lung infections. They should drink 10-12 cups of liquid a day, eat small meals and snacks several times a day, and if overweight, lose weight in an effort to reduce the shortness of breath.

LUNG VOLUME REDUCTION SURGERY
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

Medical treatment

1. Bronchodilators (pills and inhalers) open up airways to relieve wheezing or shortness of breath. Steroids such as prednisone are usually used when the disease is severe but can have side effects. People can respond differently to the same medication so you should discuss your medical therapy with your doctor.
2. Pulmonary rehabilitation and exercise may increase your endurance. It is extremely important when doing pulmonary rehabilitation that you exercise in a monitored safe atmosphere where your oxygen status can be monitored.
3. Supplemental oxygen may help to decrease the feeling of shortness of breath. The oxygen requirement is usually increased during exercise and decreased at rest. Once your physician has determined that you need oxygen it is very important to use it as prescribed.

What are the surgical options for emphysema?

Lung transplantation and lung volume reduction surgery are surgical options that are available. Surgical options for emphysema are only used when the use of all medical treatments (medications, pulmonary rehabilitation) have been tried and symptoms still persist.

What is lung volume reduction surgery?

Lung volume reduction surgery is a procedure in which 20% to 30% of the most diseased portions of the lung are removed. By reducing the size of the over-expanded lung, the diaphragm, chest wall, and rib cage are able to resume to a more normal shape and to work more efficiently.

Are all patients with emphysema candidates for lung volume reduction surgery?

No. Your physician will review certain criteria before recommending surgery.

1. The severity of your disease must be documented by complete lung function testing, chest x-rays and CT (computerized tomography) films.
2. You will be required to quit smoking at least six months before surgery.
3. If you have a history of heart surgery or previous lung surgery you may not be eligible for the surgery.

LUNG VOLUME REDUCTION SURGERY
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

4. You should have no other major disease (i.e., heart failure, cancer, recent stroke, severe osteoporosis, kyphosis or curvature of the spine, kidney failure, severe pulmonary hypertension,) or other lung disease such as severe asthma, pulmonary fibrosis, or bronchiectasis.
5. Chronic prednisone dosage should not be more than 20mg daily.
6. You must be willing to be involved in an intensive pre-and postoperative pulmonary rehabilitation program.
7. You must be in an acceptable weight range. This means a BMI ≤ 31.1 (males) and a BMI ≤ 32.3 (females).

What happens during the lung volume reduction surgery?

1. General anesthesia is given.
2. The lung is exposed (one side at a time).
3. The most diseased areas of the lung are removed, using surgical staplers to seal the remaining lung.
4. 4 chest tubes are placed in each chest cavity to allow drainage and help re-expand the lungs. It is common to have 4 tubes placed during surgery.
5. The chest is closed.
6. The patient is monitored in the Intensive Care Unit overnight.
7. The total time of the operation is 3-4 hours.

How does the lung volume reduction surgery improve shortness of breath?

The most diseased lung tissue is removed, allowing the least diseased tissue to maximize its breathing capacity. This enables the muscles used in breathing to regain their function. The rib cage and diaphragm are able to return to their normal shape because the lungs are reduced in size and better able to contract and expand while breathing.

What are the risks of surgery?

Anesthesia is always a risk for COPD patients undergoing lung volume reduction surgery. Each surgical outcome varies. Because of poor tissue healing and risk for tearing of the thinned out emphysematous lungs, there is a significant risk for persistent air leaks from the resected lung requiring prolonged chest tube drainage and possibly discharge with the chest tubes in place. As with any patient that has emphysema, pneumonia can be a severe complication, sometimes leading to death. Your physician will discuss the other associated risks from the anesthesia and the surgical procedure itself.

LUNG VOLUME REDUCTION SURGERY
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

When will my breathing improve and will I be able to stop using oxygen?

Improvement in breathing is generally noticed within six to eight weeks following the operation. This improvement is ongoing as you continue your exercise program. Exercise is very important in helping to regain your physical strength and retraining your chest wall muscles to work. It is important to understand that not all patients have improved breathing after the surgery.

The goal of the surgery is not to eliminate the need for supplemental oxygen. In fact it is very unlikely that lung volume reduction surgery will allow a patient to remain off supplemental oxygen post-operatively.

How long is the exercise program?

The exercise program before surgery consists of at least 16 sessions, each at least 2 hours completed over a 6-10 week time frame.

After surgery you need to complete at least six exercise sessions, each at least 2 hours within 8-9 weeks from your surgical date.

What is the process for becoming a candidate for lung volume reduction surgery?

All patients considering lung volume reduction must have the following screening evaluations:

- Complete medical history and physical exam
- Complete pulmonary function tests
- Arterial blood gas
- Cardiopulmonary exercise test (CPET)
- Inspiratory and expiratory chest x-rays
- Chest CT scan
- Evaluation by a Pulmonologist.

If after the above screening exams are completed and the patient is a likely candidate for lung volume reduction surgery, the following must be completed prior to an appointment with a thoracic surgeon:

Electrocardiogram (EKG)
Ultrasound of the heart (echocardiogram)
Cardiac stress test (dobutamine thallium)
6 minute hallwalk
Labs (plasma cotinine level)
Cardiopulmonary exercise test (CPET)
Pulmonary rehabilitation (at least 16 sessions)

LUNG VOLUME REDUCTION SURGERY
UNIVERSITY OF MICHIGAN HEALTH SYSTEM

Will my insurance cover the procedure?

As of January 1, 2004 Medicare will now cover lung volume reduction surgery at selected sites across the United States. If you do not have Medicare insurance then, written approval from your insurance company stating they will pay for surgery will be required before an appointment with a thoracic surgeon can be made.

Where can I get more information?

You may contact the Dyspnea Clinic at the University of Michigan.

University of Michigan Dyspnea Clinic
3916 Taubman Center Box 0361
1500 East Medical Center Drive
Ann Arbor, MI 48109-0361
Phone: 734-763-7668
Toll free: 1-888-284-5864
Fax: 734-936-3494