

## Lung Surgery

### Understanding the Lungs and Chest

The lungs are two sponge-like organs that allow us to breathe. They are part of the respiratory system, which also includes the nose, mouth, trachea (windpipe) and the airways that lead into each lung. Air travels through large airways called bronchi and then into smaller passages known as bronchioles. The lungs sit within the chest and are protected by the rib cage.

Each lung is divided into sections called lobes. The left lung has two lobes, while the right lung has three. The lungs rest on the diaphragm, a wide, thin muscle that plays a key role in breathing and separates the chest from the abdomen.

The space between the two lungs is called the mediastinum. This area contains several vital structures, including the heart and large blood vessels, the trachea which carries air into the lungs, the oesophagus which carries food to the stomach, and lymph nodes that help fight infection by collecting and destroying bacteria and viruses.

The lungs are covered by two thin layers of tissue known as the pleura. The inner layer, called the visceral pleura, covers the surface of the lungs, while the outer layer, called the parietal pleura, lines the chest wall, mediastinum and diaphragm. A small amount of fluid lies between these layers, allowing them to move smoothly against each other during breathing. The space between the two pleural layers is called the pleural cavity, and in healthy lungs this space is only potential, meaning the layers sit closely together without an actual gap.

### What is Lung Cancer

Lung cancer develops when abnormal cells in the lungs grow and multiply in an uncontrolled way. Cancer that starts in the lungs is called **primary lung cancer**. It can spread within the lungs and to other parts of the body, including the lymph nodes, pleura, brain, adrenal glands, liver and bones.

When cancer spreads to the lungs from another part of the body, such as the breast or bowel, it is called **secondary (metastatic) lung cancer**. This information refers to primary lung cancer only.

### Types of lung cancer

There are two main types of primary lung cancer.

#### Non-small cell lung cancer (NSCLC)

This is the most common type, making up about 85% of lung cancers. It includes:

- Adenocarcinoma, which begins in mucus-producing cells and is often found in the

outer parts of the lungs

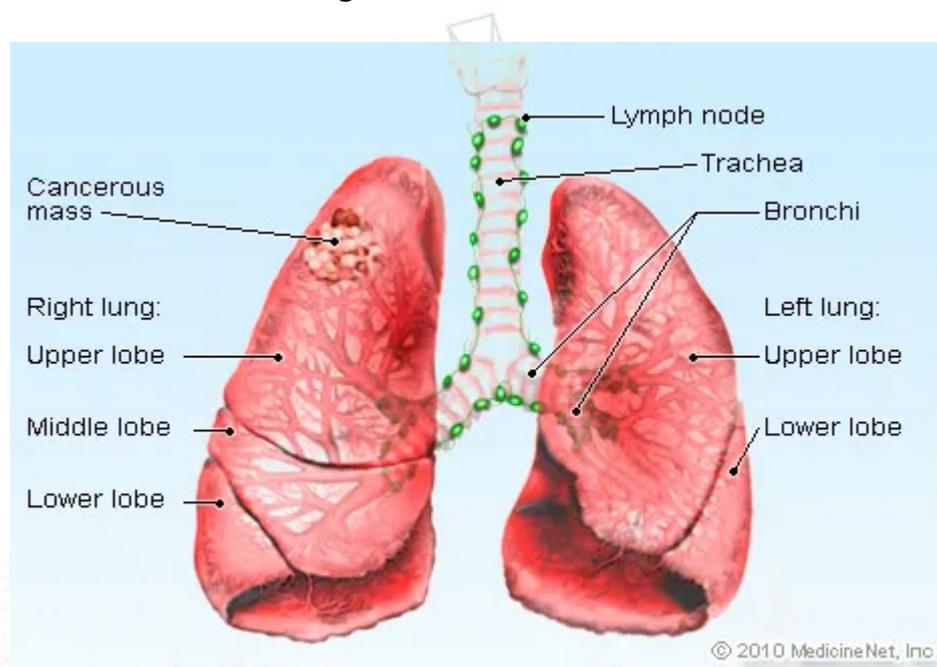
- Squamous cell carcinoma, which starts in thin, flat cells and usually develops in the larger airways
- Large cell undifferentiated carcinoma, where the cancer cells do not clearly fit into other categories

There are also rarer forms of NSCLC, including adenosquamous carcinoma, sarcomatoid carcinoma, salivary gland carcinoma and carcinoid tumours.

### **Small cell lung cancer (SCLC)**

This type accounts for about 15% of lung cancers. It usually starts in the central part of the lungs and tends to spread more quickly than non-small cell lung cancer.

Pleural mesothelioma is a cancer of the pleura, the lining around the lungs. It is different from lung cancer and is most often caused by asbestos exposure. Other cancers and lung conditions may affect the lungs or cause similar symptoms, but they are not classified as lung cancer.



### **What causes lung cancer**

A risk factor is anything that increases the chance of developing lung cancer. Some risk factors can be avoided or reduced, while others cannot. Some people develop lung cancer even without known risk factors.

#### **Lifestyle factors**

- Tobacco smoking is the main cause of lung cancer. The risk increases the earlier a person starts smoking, the longer they smoke, and the more they smoke.
- People who have never smoked can also develop lung cancer. Around 15% of cases in men and about 30% of cases in women occur in people who have never smoked.

### **Environmental and work-related factors**

- Second-hand smoke can increase the risk of lung cancer, with living with a smoker raising the risk by up to 30% in non-smokers.
- Asbestos exposure increases the risk of lung cancer and pleural mesothelioma. Although banned in Australia since 2004, asbestos may still be present in older buildings and fences.
- Exposure to radon gas, air pollution, diesel exhaust, welding fumes, and certain metals such as arsenic, cadmium and nickel may increase risk.
- Inhaling crystalline silica dust from materials such as stone, concrete or engineered stone can cause silicosis and is a known risk factor for lung cancer. The use of engineered stone has been banned in Australia since July 2024.

### **Personal factors**

- Lung cancer is most commonly diagnosed in people over 60 years of age, although younger people can also be affected.
- A family history of lung cancer may slightly increase risk.
- Having certain lung diseases, such as pulmonary fibrosis, chronic bronchitis, emphysema, COPD, tuberculosis, or conditions such as HIV, may also raise the risk.

### **Symptoms of lung cancer**

The main symptoms of lung cancer can include a new cough that lasts for more than three weeks, or a long-standing cough that becomes worse over time. People may also experience shortness of breath or wheezing, pain in the chest or shoulder, repeated chest infections or an infection that does not clear after three weeks and coughing or spitting up blood.

Lung cancer can also cause more general symptoms. These may include ongoing tiredness, unexplained weight loss, a hoarse voice, difficulty swallowing, abdominal or joint pain, swelling of the neck or face, night sweats, and enlarged fingertips, known as finger clubbing.

Having one or more of these symptoms does not necessarily mean you have lung cancer, as they can be caused by other conditions or by the effects of smoking. In some cases, there may be no symptoms at all and the cancer is found during routine tests for another reason. If you do have symptoms, it is important to see your doctor as soon as possible.

Your doctors will arrange a number of tests to confirm a diagnosis and to determine whether the cancer is confined to the lung or has spread elsewhere. The results of these tests will help them recommend the most appropriate treatment plan for you.

### **Types of Lung Surgery**

Surgery for lung cancer may involve removing part or all of a lung, depending on where the cancer is located and how large it is.

### **Segmentectomy or wedge resection**

- These procedures are usually used for early-stage cancers near the outer edge of the lung. A segmentectomy removes a small section of a lung lobe, while a wedge resection removes an even smaller piece of lung tissue and may be used if a patient is too unwell for more extensive surgery.

### **Lobectomy**

- This is the most common type of lung cancer surgery and involves removing one lobe of the lung, which is about 30–50% of the lung. The remaining lung tissue is left in place to allow breathing to continue as normally as possible.

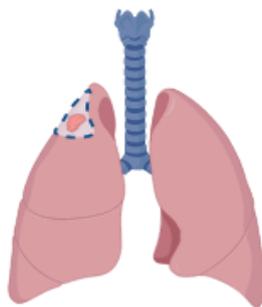
### **Pneumonectomy**

- This operation is used when cancer involves more than one lobe or is close to the main airways entering the lung. The entire lung is removed, and most people are still able to breathe adequately with just one lung.

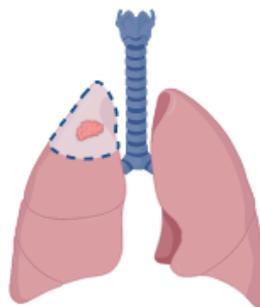
### **Removal of lymph nodes**

- Lymph nodes close to the tumour are removed during surgery to check whether the cancer has spread. The results help guide decisions about further treatments such as chemotherapy or radiation therapy.

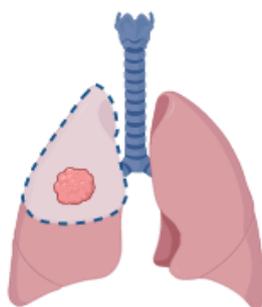
## **Lung Cancer Surgery**



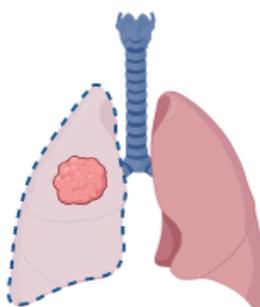
**Wedge resection**



**Segmental resection**



**Lobectomy**



**Pneumonectomy**

## How lung surgery is performed

All lung surgery is carried out under a general anaesthetic. There are two main surgical approaches.

### Thoracotomy (open surgery)

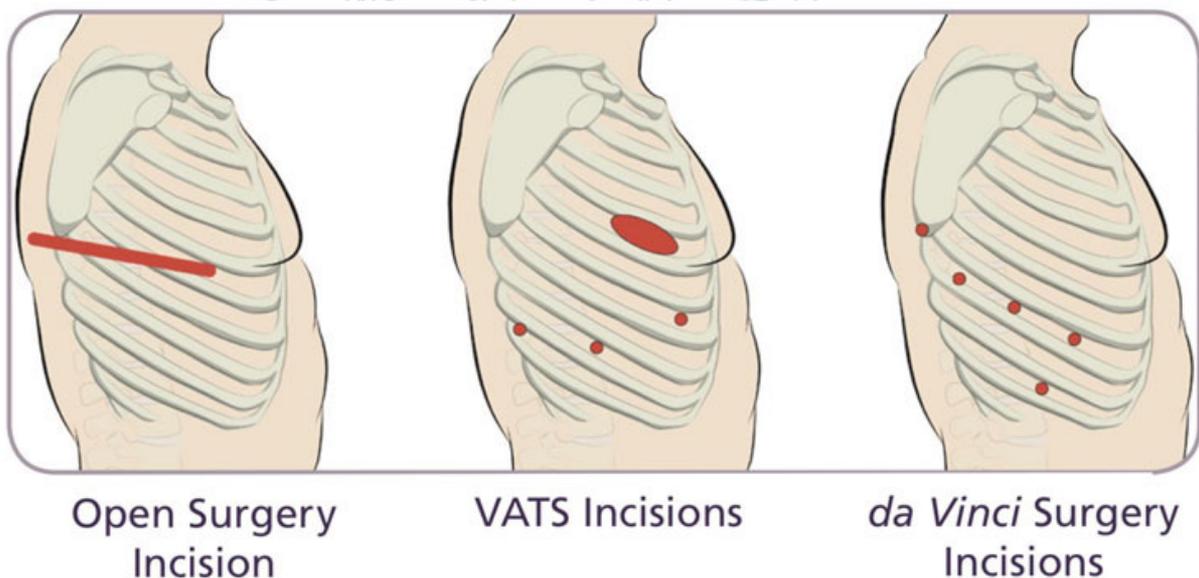
- This approach involves a longer incision between the ribs and usually requires a hospital stay of 3–7 days. In some cases, surgery may begin as VATS but need to be converted to a thoracotomy during the procedure.

### Video-assisted thoracoscopic surgery (VATS)

- This is a keyhole technique where several small cuts are made in the chest wall. A tiny camera and surgical instruments are used to perform the operation, often resulting in a shorter hospital stay, faster recovery and fewer side effects.

### Da Vinci Robotic assisted thoracoscopic surgery

Robotic-assisted surgery uses computer enhanced robotic technology allowing a surgeon to operate on the chest area using a 3D HD camera and tiny rotating instruments. These instruments move in a similar way to a human hand but with a greater range of movement and accuracy.



## After Surgery

Recovery after lung surgery involves close monitoring, pain management, and gradual mobilization to ensure healing and prevent complications.

It involves close monitoring in a recovery or intensive care unit. You may have several tubes in place such as an intravenous line for fluids and medications, and a chest tube to drain fluid and air from the chest cavity.

Effective pain control is crucial for recovery and can be managed using intravenous and oral medications.

Early mobilisation is encouraged to prevent complications like blood clots and pneumonia. You will be assisted in sitting up and taking short walks as you are able from the first day after surgery. Walking every couple of hours is a good goal to help improve circulation and lung function.

Deep breathing exercises are important for lung recovery. You will be taught specific deep breathing and coughing techniques by the physiotherapists and medical team. You will be encouraged to use them frequently to help clear secretions and expand your lungs.

## Recovery

Most patients transition from the ICU (if required) to the ward within a day or two. The total hospital stay typically lasts between three to seven days depending on the extent of the surgery and post-operative recovery progress.

You will receive specific instructions on how to care for your surgical incision(s) to prevent infection and promote healing

After discharge from hospital, it may take several weeks to months to fully recover. Regular rest, gentle exercise, adherence to recommended medication is advised. It is normal to feel fatigue, soreness and shortness of breath as your body heals.

Regular follow up appointments with your healthcare provider are important to monitor recovery and address any concerns.

Be aware of signs of complications such as increased pain, fever or changes in breathing. Persistent pain or breathing difficulties may require medical attention.