

Lung Cancer

J A S C A P

**JEET ASSOCIATION FOR SUPPORT TO CANCER PATIENTS MUMBAI, INDIA
JASCAP**

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JASCAP is a charitable trust that provides information on various aspects of cancer. This can help the patient and his family to understand the disease and its treatment and thus cope with it better.

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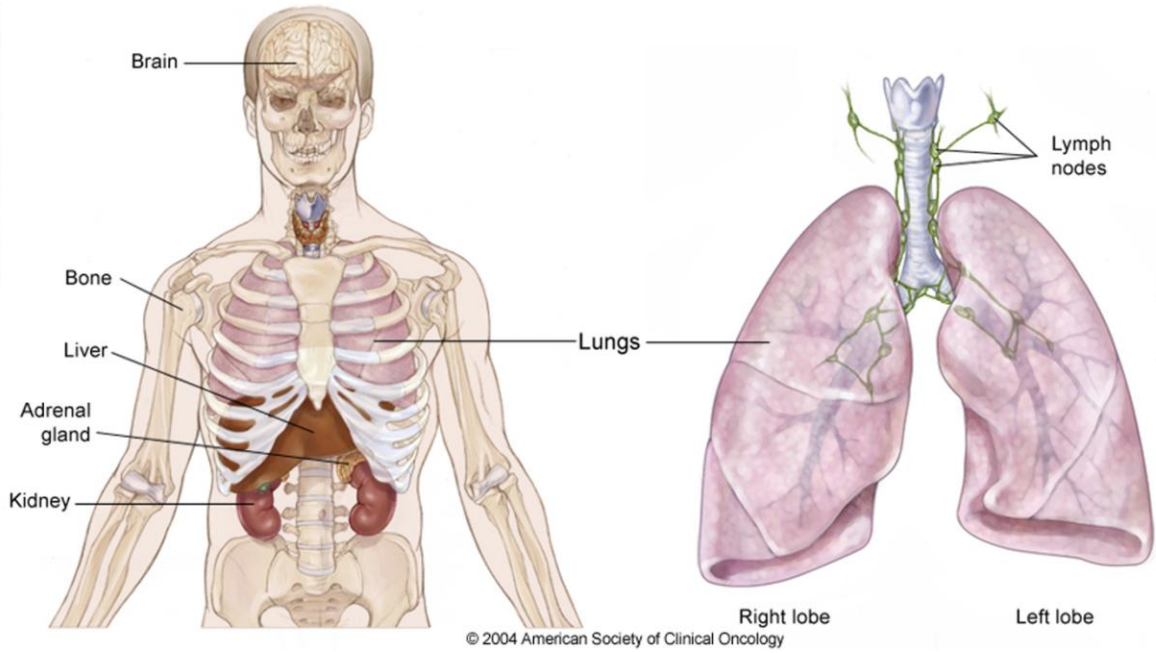
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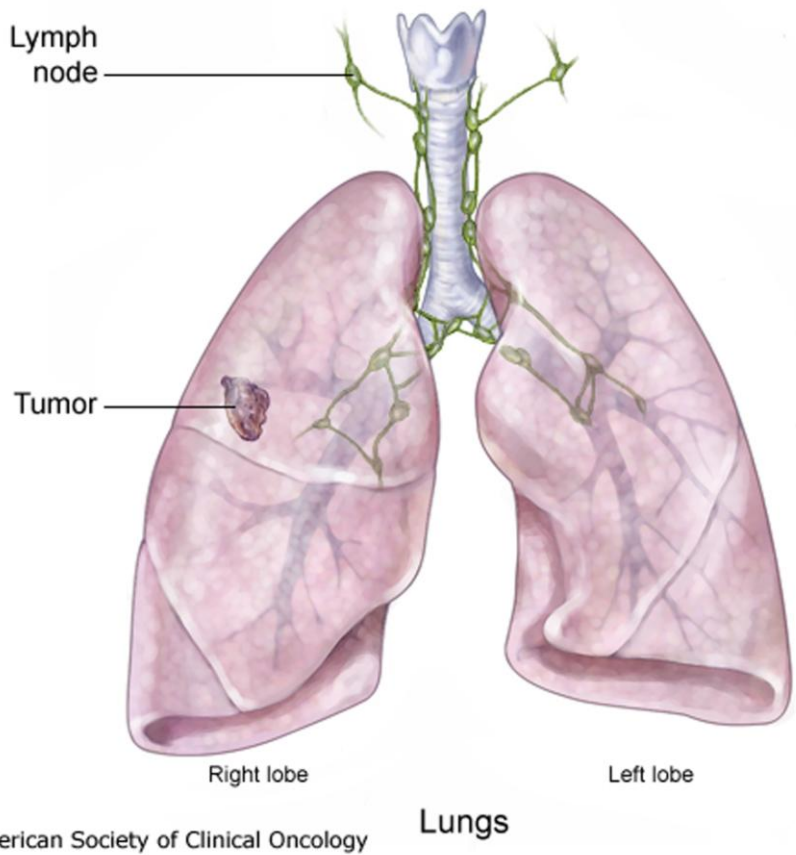
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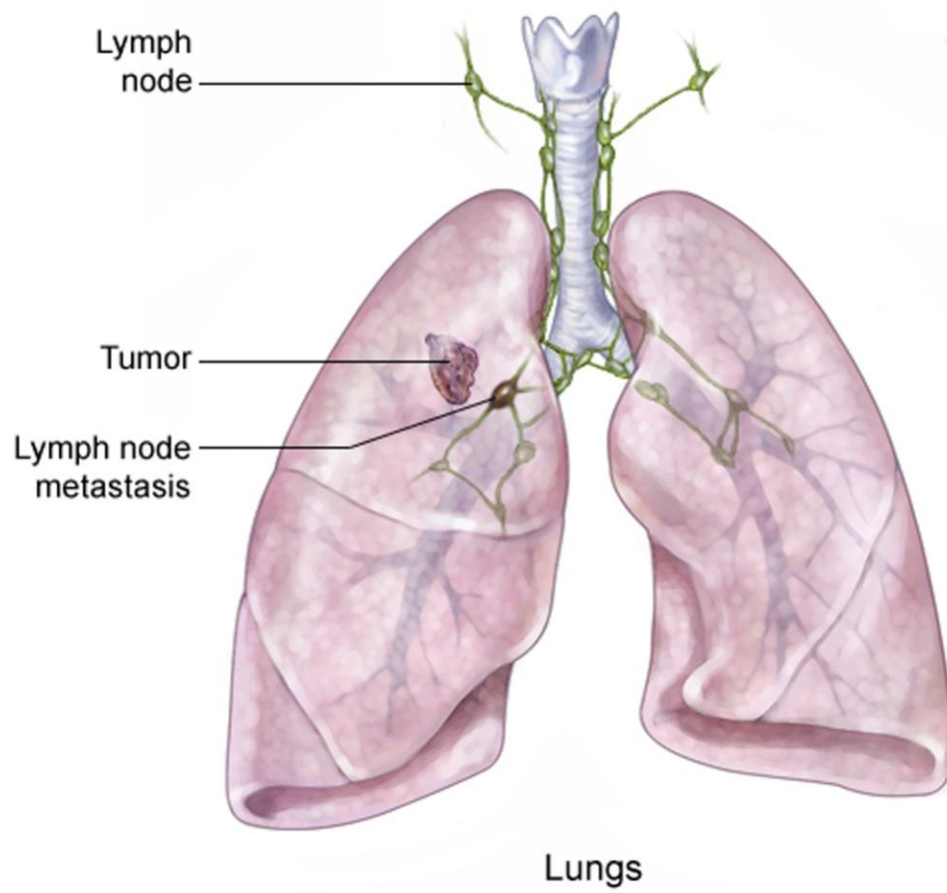


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Stage I Cancer

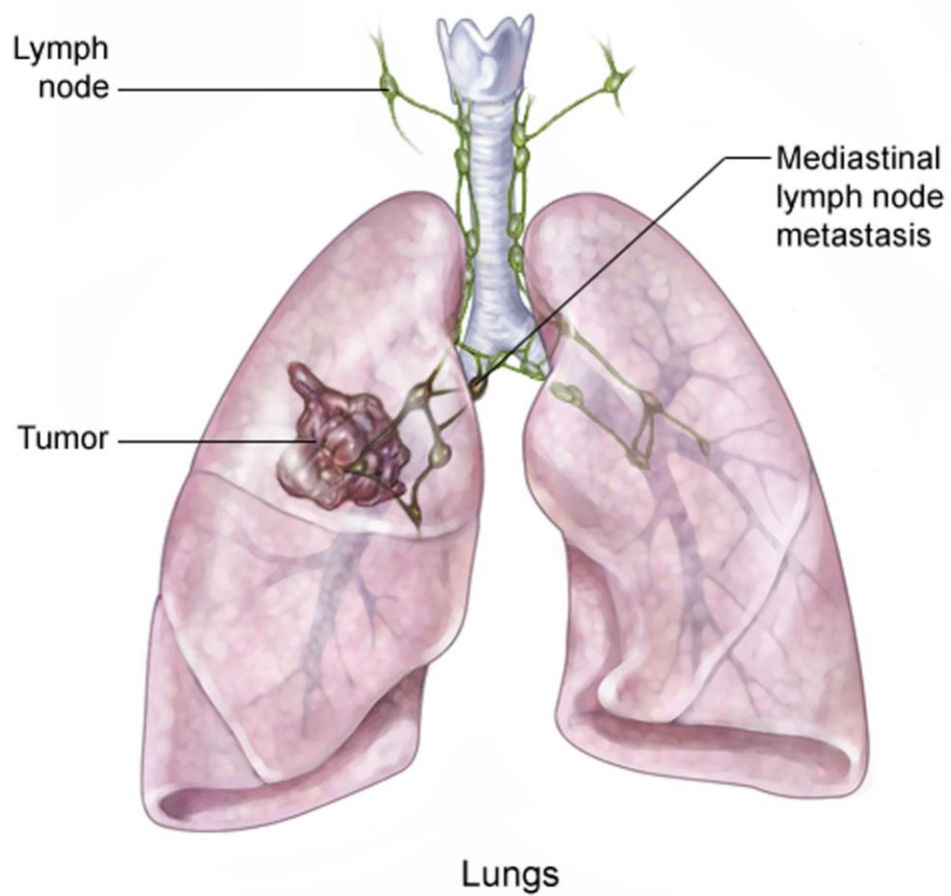


Stage II Cancer

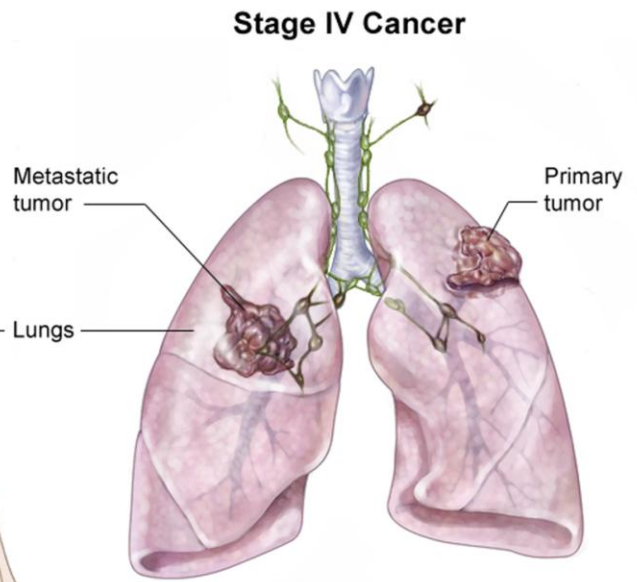
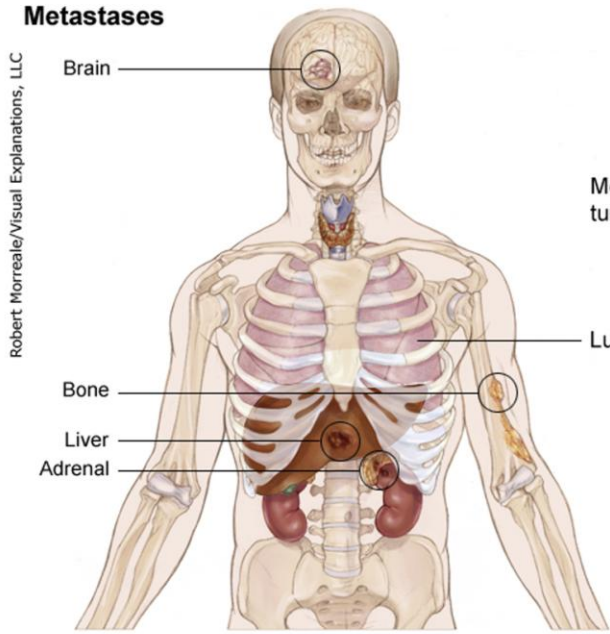


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Stage III Cancer



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Lung Cancer

Introduction

This booklet is for you if you have or someone close to you has cancer of the lung.

If you are a patient your doctor or nurse may wish to go through the booklet with you and mark sections that are particularly important for you.

The lungs

When you breathe in, air passes from your nose or mouth through the windpipe (**trachea**), which divides into two tubes (airways), one going to each lung. These are known as the right and left **bronchus** and they divide to form smaller tubes called **bronchioles**, which carry air through the lungs. At the end of the bronchioles are millions of tiny air sacs called **alveoli**. In the alveoli, oxygen is absorbed from the air we breathe in and passes into the bloodstream to be circulated around the body.

Carbon dioxide is a waste gas that must be removed from the body. It passes from the bloodstream into the alveoli and is then breathed out by the lungs.

The right lung has three main areas (known as lobes) and the left lung has two.

Many lung cancers start in the cells lining the bronchi and are called **carcinomas of the bronchus**.

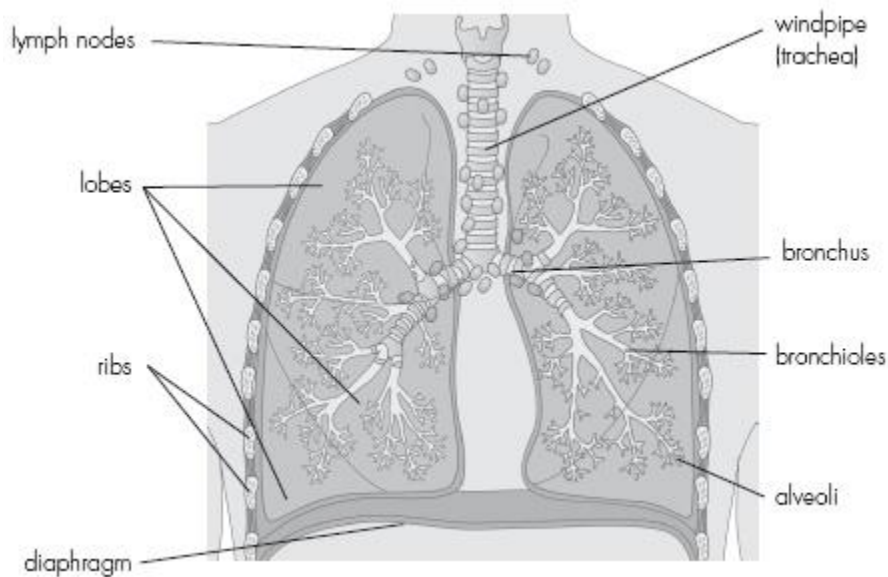
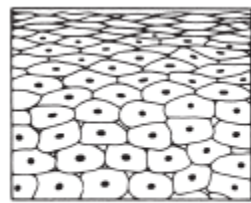


Figure: The lungs and surrounding structures

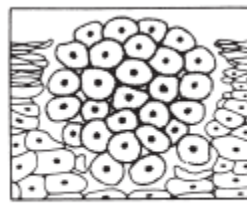
What is cancer?

The organs and tissues of the body are made up of tiny building blocks called cells. Cancer is a disease of these cells.

Cells in different parts of the body may look and work differently but most reproduce themselves in the same way. Cells are constantly becoming old and dying, and new cells are produced to replace them. Normally, cells divide in an orderly and controlled manner. If for some reason the process gets out of control, the cells carry on dividing, developing into a lump which is called a **tumour**.



Normal cells



Cells forming a tumour

Tumours can be either **benign** or **malignant**. Cancer is the name given to a malignant tumour. Doctors can tell if a tumour is benign or malignant by examining a small sample of cells under a microscope. This is called a **biopsy**.

In a benign tumour the cells do not spread to other parts of the body and so are not cancerous. However, if they continue to grow at the original site, they may cause a problem by pressing on the surrounding organs.

A malignant tumour consists of cancer cells that have the ability to spread beyond the original area. If the tumour is left untreated, it may spread into and destroy surrounding tissue. Sometimes cells break away from the original (primary) cancer. They may spread to other organs in the body through the bloodstream or lymphatic system.

The lymphatic system is part of the immune system - the body's natural defence against infection and disease. It is a complex system made up of organs, such as bone marrow, the thymus, the spleen, and lymph nodes. The lymph nodes (or glands) throughout the body are connected by a network of tiny lymphatic ducts.

When the cancer cells reach a new area they may go on dividing and form a new tumour. This is known as a **secondary cancer** or **metastasis**. Even when the cancer spreads somewhere else in the body, it is still referred to as the site where it was originated, and is still named after the part of the body where it started. For example, if lung cancer spreads to bones, it is still termed as lung cancer and not bone cancer. In that case, it may be said that the person has "*lung cancer with bone metastases*".

It is important to realise that cancer is not a single disease with a single type of treatment. There are more than 200 different kinds of cancer, each with its own name and treatment.

Types of cancer

Carcinomas

The majority of cancers, about 85% (85 in a 100), are carcinomas. They start in the epithelium, which is the covering (or lining) of organs and of the body (the skin). The common forms of breast, lung, prostate and bowel cancer are all carcinomas.

Carcinomas are named after the type of epithelial cell that they started in and the part of the body that is affected. There are four different types of epithelial cells:

- squamous cells - that line different parts of the body, such as the mouth, gullet (oesophagus), and the airways
- adeno cells - form the lining of all the glands in the body and can be found in organs such as the stomach, ovaries, kidneys and prostate
- transitional cells - are only found in the lining of the bladder and parts of the urinary system
- basal cells - that are found in one of the layers of the skin.

A cancer that starts in squamous cells is called a squamous cell carcinoma. A cancer that starts in glandular cells is called an adenocarcinoma. Cancers that start in transitional cells are transitional cell carcinomas, and those that start in basal cells are basal cell carcinomas.

Leukaemias and lymphomas

These occur in the tissues where white blood cells (which fight infection in the body) are formed, i.e. the bone marrow and lymphatic system. Leukaemia and lymphoma are quite rare and make up about 6.5% (6.5 in 100) of all cancers.

Sarcomas

Sarcomas are very rare. They are a group of cancers that form in the connective or supportive tissues of the body such as muscle, bone and fatty tissue. They account for less than 1% (1 in 100) of cancers.

Sarcomas are split into two main types:

- bone sarcomas - that are found in the bones
- soft tissue sarcomas - that develop in the other supportive tissues of the body.

Others forms of cancer

Brain tumours and other very rare forms of cancer make up the remainder of cancers.

Types of lung cancer

Primary lung cancer

Each year over 38,000 people in the UK are diagnosed with lung cancer.

There are two main types of primary lung cancer, which behave and respond to treatment quite differently. They are:

- non-small cell lung cancer (NSCLC)
- small cell lung cancer (SCLC).

About 1 in 5 lung cancers are small cell; the rest are non-small cell.

Non-small cell lung cancer

There are three main types of non-small cell lung cancer. Sometimes it's not possible to tell which type someone has. This is because when the cells are looked at under a microscope they are not developed enough. The three types are:

Squamous cell carcinoma: This is the most common type of lung cancer. It develops in the cells which line the airways. This type of lung cancer is often caused by smoking.

Adenocarcinoma: This develops from the cells which produce mucus (phlegm) in the lining of the airways. This type of cancer is becoming more common.

Large cell carcinoma: This gets its name from the large, rounded cells that are seen when they are examined under the microscope. It is sometimes known as undifferentiated carcinoma.

Mesothelioma

A less common type of cancer that can affect the covering of the lungs is called mesothelioma. It is a cancer of the membrane which covers the surface of the lungs and lines the inside of the chest. It often occurs in people who have been exposed to asbestos.

Mesothelioma is discussed in its own booklet.

Causes of lung cancer

Following are the well recognised risk factors for Lung Cancer:

- Smoking
- Genetic risk
- Asbestos
- Radon gas
- Other causes

Causes

Smoking

Smoking causes Lung Cancer

Cigarette smoking is known to be the cause of most lung cancers. The more you smoke, the greater your risk of developing lung cancer. Lung cancer is also more likely to develop in people who start smoking at a young age. People who don't smoke can also develop lung cancer, although this is much rarer. Filtered and low-tar cigarettes may slightly reduce a person's risk of developing cancer, but the risk is still far greater than that of a non-smoker.

Lung cancer has always been more common in men, particularly those over 40, as more men used to smoke than women. However, as more women have started smoking, the number of women developing lung cancer has gone up considerably.

Stopping smoking

If a person stops smoking, the risk of lung cancer falls quite quickly. After about fifteen years, that person's chances of developing the disease and cancer are slightly higher than the one who has never smoked.

Passive smoking

It now appears that breathing in other people's cigarette smoke (passive smoking) increases the risk of lung disease and cancer. The risk is still much less than for the one who smokes himself.

Pipes and cigars

Although pipe and cigar smokers have a lower risk of lung cancer than cigarette smokers, they are still at a much greater risk than non smokers.

Cannabis

Smoking cannabis may also increase the risk of developing lung cancer. Although less is known about the harmful effects of smoking cannabis, it is believed to cause similar damage to the cells in the lungs as smoking tobacco.

Genetic risk

In some families, smokers may be more likely to develop lung cancer due to inherited faulty genes.

Asbestos

People who have been in prolonged or close contact with asbestos have a higher risk of lung cancer, especially if they smoke. Asbestos and tobacco smoke act together to increase the risk. Many people have been in contact with asbestos during their working lives. Low-level exposure increases the risk of lung cancer only slightly (compared to the risk from smoking), while heavy exposure may result in a much higher risk.

Asbestos exposure also increases the risk of mesothelioma, a cancer of the membranes which cover the lungs.

Radon gas

In some parts of the UK, such as the West Country and the Peak District, a naturally occurring gas called radon can pass from the soil into the foundations of buildings. It is now thought that in high concentrations this gas may increase the risk of developing lung cancer.

Other causes

Contact with certain chemicals and substances – such as uranium, chromium and nickel – can cause lung cancer, but these are very rare causes. Air pollution has been suggested as a cause of lung cancer, but this is difficult to prove.

Lung cancer is not infectious and cannot be passed on to other people.

How common is the Lung Cancer in India?

Lung cancer is the most common cancer among men from the Indian subcontinent and is the number one killer of men dying due to any cancer related affliction. For women the incidence of Lung Cancer ranks ninth among all other cancers. Considering all the cancers among men and women together, Lung Cancer ranks number four in India¹

In India, between the years 2001-2003, across five urban centers - Mumbai, Delhi, Chennai, Bhopal and Bangalore, – and one rural center - Barshi, a total of 4,137 cases of Lung cancer were registered (9.4% of all cancers) for males across all age groups; while 1,140 cases of Lung cancer were registered (2.55% of all cancers) for females across all age groups. Considering all men, women and children with all types of

¹ Globocan 2008: Cancer incidence and mortality rates worldwide

cancers together, a grand total of 5,277 cases of Lung cancer (6% of all cancers) were registered at the six centers mentioned above, between the year 2001-2003².

The TATA Memorial Hospital (T.M.H.) in Mumbai, India registered a grand-total of 19,127 cases of all types of cancer patients in the year 2006 for men, women and children combined, out of which 1,064 (5.6% of the total cases) were diagnosed with the Lung cancer. Out of the total 1,064 patients diagnosed with Lung cancer, mentioned above at the T.M.H., 812 (76%) were males and 252 (24%) were females³.

Symptoms and Diagnosis of lung cancer

Symptoms of Lung Cancer

The symptoms of lung cancer may include any of the following:

- a continuing cough, or change in a long-standing cough
- a chest infection that doesn't get better
- increasing breathlessness
- coughing up blood-stained phlegm (sputum)
- a hoarse voice
- a dull ache, or a sharp pain, when you cough or take a deep breath
- loss of appetite and loss of weight
- difficulty swallowing
- excessive tiredness (fatigue) and lethargy.

If you have any of the above symptoms, it's important to have them checked by your doctor. All of these symptoms may also be caused by illnesses other than cancer.

Diagnosis of Lung Cancer

Most people begin by seeing their Family doctor when they develop symptoms. Your Family doctor will examine you and arrange for you to have tests or x-rays. Your Family doctor may need to refer you to the hospital for these tests, and for specialist advice and treatment.

At the hospital, the specialist will ask you about your general health and any previous medical problems before examining you. A chest x-ray will be taken to check for any

²Population based cancer registry 2001-2003 Mumbai, Delhi, Chennai, Bhopal, Barshi and Banglore, Indian Cancer Society.

³ TATA Memorial Hospital Registry Data for 2006

abnormalities in your lungs. You may also be asked to give samples of phlegm (sputum), so that they can be examined under a microscope for cancer cells – this is known as **sputum cytology**.

The following tests may be used to diagnose cancer of the lung. Your doctor may arrange for you to have one or more of them.

- CT scan
- Spiral CT scan
- Bronchoscopey

CT scan

A CT (computerised tomography) scan takes a series of x-rays which build up a three-dimensional picture of the inside of the body. The scan is painless but takes 10 to 30 minutes. CT scans use a small amount of radiation, which will be very unlikely to harm you and will not harm anyone you come into contact with. You will be asked not to eat or drink for at least four hours before the scan.

You may be given a drink or injection of a dye which allows particular areas to be seen more clearly. For a few minutes this may make you feel hot all over. If you are allergic to iodine or have asthma you could have a more serious reaction to the injection, so it's important to let your doctor know beforehand.

You will probably be able to go home as soon as the scan is over.

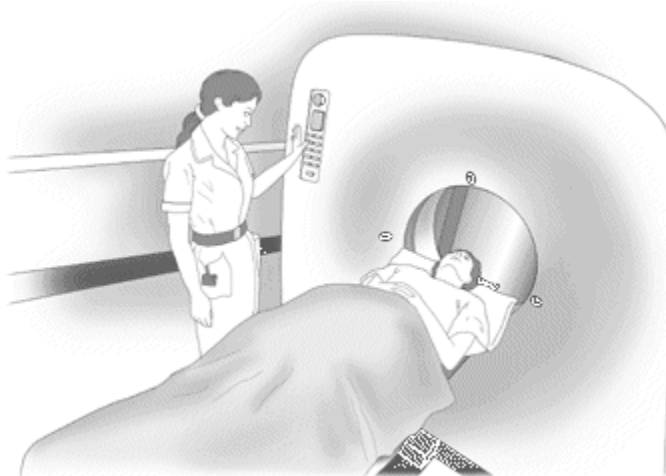


Figure: Having a CT scan

Spiral CT scan

Some hospitals use low-dose spiral CT scans (helical CT scans). A CT scanning machine rotates rapidly around the body, taking more than one hundred pictures in sequence. The scan can detect smaller lung tumours than a conventional CT scan and takes only a few minutes. Spiral CT scans are quite new and you may have to travel to a specialist hospital to have one. They are not always necessary, but you can discuss with your doctor whether one would be useful in your case.

Bronchoscopy

A doctor, or a specially trained nurse, examines the inside of the lung airways and takes samples (biopsies) of the cells. Normally a thin, flexible tube called a bronchoscope is used and the test is carried out under local anaesthetic. Sometimes a rigid bronchoscope is used instead. In this case, a general anaesthetic is given and you may have to stay in hospital overnight. A CT scan will tell the doctors whether a bronchoscopy will be helpful. It will also guide the doctor or nurse to the abnormal area in the lung.

Before your bronchoscopy, you will be asked not to eat or drink anything for a few hours. Just before the test you may be given a mild sedative, to help you relax and to relieve any discomfort. You will be given another medicine which reduces the production of natural fluids in the mouth and throat. This medicine can make your mouth feel dry.

Once you are comfortable, a local anaesthetic will be sprayed onto the back of your throat, making it numb. The bronchoscope is then gently passed into your nose or mouth and down into the lung airways. The doctor or nurse can look through the bronchoscope to check for any abnormalities. Photographs and biopsies can be taken at the same time.

The test may be slightly uncomfortable, but it only takes a few minutes. You shouldn't eat or drink for at least an hour afterwards, because your throat will be numb and you won't know if food and drink is going down the wrong way. As soon as the sedation has worn off you will be able to go home. You shouldn't drive for 24 hours after the test as you may feel sleepy, so you'll need to arrange for someone to collect you from hospital. You may have a sore throat for a couple of days after your test, but this will soon disappear.

Further tests for diagnosis of Lung Cancer

If the first tests suggest that you may have lung cancer, your specialist may want to do some of the further tests described below, to confirm the diagnosis and to see if the cancer has spread to any other part of the body. The results will help your doctor to decide the best type of treatment for you.

- MRI scan
- Mediastinoscopy
- Lung biopsy

- PET scan
- Ultrasound scan
- Isotope bone scan
- Lung function tests

MRI scan

An MRI (magnetic resonance imaging) scan is similar to a CT scan, but uses magnetic fields instead of x-rays to build up a series of cross-sectional pictures of the body. During the test you will be asked to lie very still on a couch inside a metal cylinder that is open at both ends. The whole test may take up to an hour and is painless. The machine is very noisy, but you will be given earplugs or headphones to wear.

The cylinder is a very powerful magnet, so before going into the room you should remove all metal belongings. You should also tell your doctor if you have ever worked with metal or in the metal industry, or if you have any metal inside your body (for example, a cardiac monitor, pacemaker, surgical clips, or bone pins). You may not be able to have an MRI because of the magnetic fields.

Some people are given an injection of dye into a vein in the arm, but this usually doesn't cause any discomfort. If you feel claustrophobic inside the cylinder, you may be able to take someone into the room to keep you company. It may also help to mention to the staff beforehand if you don't like enclosed spaces. They can then offer extra support during your test.

An MRI scan can often distinguish between different types of body tissue more precisely than a CT scan, so in some situations it will give extra information.

Mediastinoscopy

In this test, the doctor examines the area at the centre of your chest (**mediastinum**), and the lymph nodes closest to the lungs. These are often the first places that lung cancer spreads to, and so are usually checked for signs of cancer. The test is done under a general anaesthetic and will mean a short stay in hospital.

A small cut is made in the skin at the base of your neck, and a tube is passed into the chest. The tube has a light and camera at the end, and can magnify the areas it looks at. The doctor can see any abnormal areas, and may also take samples of the cells and lymph nodes to examine under a microscope.

A similar test, known as a **thoracoscopy**, involves making a small cut in the skin and inserting a similar tube into another part of your chest, to look directly at the cancer and take samples from it.

Lung biopsy

This test is usually done in the x-ray department, most commonly during a CT scan. A local anaesthetic is used to numb the area. You will then be asked to hold your breath

while a thin needle is passed through the skin and into the lung. An x-ray is used to make sure that the needle is in the right place. The doctors will then take a sample of cells to be examined under a microscope. The biopsy is sometimes slightly uncomfortable, but it only takes a few minutes.

After a lung biopsy, a small number of people may develop air between the layers that cover the lungs. This is known as a **pneumothorax**. Symptoms of a pneumothorax include sharp chest pain, breathlessness and a tight chest. You may be asked to remain in hospital for a few hours after your biopsy, to make sure that you have not got a pneumothorax. Let your doctor or nurse know if you develop any symptoms.

PET scan

A PET (positron emission tomography) scan uses low-dose radioactive glucose (a type of sugar) to measure the activity of cells in different parts of the body. A very small amount of this mildly radioactive substance is injected into a vein, usually in your arm. A scan is then taken a couple of hours later. Areas of cancer usually absorb more of the sugar than surrounding tissue and so show up on the scan.

PET scans may be used before surgery as they can give accurate information about the size of the cancer in the lung and whether a cancer has spread beyond the lungs. They can also be used to examine any lumps that remain after treatment to see whether they are scar tissue or whether cancer cells are still present. PET scans are a new type of scan and you may have to travel to a specialist centre to have one. They are not always necessary but you can discuss with your doctor whether one would be useful in your case.

Ultrasound scan

Ultrasound uses sound waves to look at the liver and the other organs in the upper part of the abdomen. It is the same sort of scan that pregnant women have.

Once you are lying comfortably on your back, a gel is spread on to the area to be scanned.

A small device that produces sound waves is passed over the area and the sound waves are converted into a picture by computer. The test only takes a few minutes.

Isotope bone scan

This is more sensitive than an x-ray, and shows up any abnormal areas of bone more clearly. However, it is not always clear whether an abnormality is caused by cancer or other conditions such as arthritis.

A small amount of a mildly radioactive substance is injected into a vein, usually in your arm. Abnormal bone absorbs more radioactivity than normal bone, so these areas are highlighted and picked up by the scanner as 'hot spots'. There is generally a wait of 2–3 hours between having the injection and the scan taking place, so you may like to take a

magazine or book to pass the time. The level of radioactivity used in the scan is very small and doesn't cause any harm.

Lung function tests

If your doctor wants to remove the lung cancer using surgery, or is planning for you to have a course of radiotherapy, they may first ask you to have breathing tests to see how well your lungs are working.

It will probably take several days for the results of your tests to be ready, and this waiting period will obviously be an anxious time for you. It may help to talk things over with a close friend or relative.

Staging of lung cancer

The stage of a cancer is a term used to describe its size, position and whether it has spread beyond where it started in the body. Knowing the extent of the cancer helps the doctors to decide on the most appropriate treatment.

Generally cancer is divided into four stages:

Stage 1 small and localised

Stages 2 or 3 has spread into surrounding structures

Stage 4 has spread to other parts of the body.

If the cancer has spread to distant parts of the body, this is known as secondary or metastatic cancer.

The staging is different for small cell and for non-small cell lung cancers.

Staging for Small cell lung cancer

Small cell lung cancers are divided into just two stages. This is because small cell lung cancer often spreads outside the lung quite early on. Even if the doctor can't see any spread of the cancer on your scans, it's likely that some cancer cells will have broken away and travelled through the bloodstream or lymph system.

To be safe, small cell lung cancers are usually treated as though they have spread, whether any secondary cancer can be seen or not.

The two stages of small cell lung cancers are:

Limited disease – the cancer cells can be seen only in one lung, in nearby lymph nodes, or in fluid around the lung (known as a pleural effusion).

Extensive disease – it is clear that the cancer has spread outside the lung, within the chest area or to other parts of the body.

Staging for Non-small cell lung cancer

Non-small cell lung cancer is usually divided into four stages.

Stage 1 cancer is localised and has not spread to the lymph nodes. This stage is further divided in two:

Stage 1A The cancer is no bigger than 3cm in size.

Stage 1B The cancer is larger than 3cm, or growing into the main airway of the lung (bronchus). The cancer may also have spread to the membrane covering the lung (pleura), or made the lung partially collapse.

Stage 2 for non-small cell lung cancer is also divided in two:

Stage 2A The cancer is small and measures 3cm or less in size and affects nearby lymph nodes.

Stage 2B Either the cancer is larger than 3cm and in the nearby lymph nodes, **or** there is no cancer in the lymph nodes, but the tumour has made the whole lung collapse; or it has grown into the chest wall, the membrane covering the lung (pleura), the muscle layer below the lungs (diaphragm), or the covering of the heart (pericardium).

Stage 3 for non-small cell lung cancer is also divided in two:

Stage 3A The cancer is of any size and has spread into the lymph nodes in the middle of the chest (mediastinum), but not to the other side of the chest. **or**, the cancer has spread into tissue around the lung near to where the cancer started. This can be into:

- the chest wall
- the covering of the lung (pleura)
- the middle of the chest (mediastinum) **or**
- other lymph nodes close to the affected lung.

Stage 3B The cancer has spread
to lymph nodes on either side of the chest **or** above either collar bone
to another major structure such as the gullet (oesophagus), the heart,
windpipe (trachea) **or** to a main blood vessel.

or there may be

- two or more tumours in the same lung
- a collection of fluid containing cancer cells around the lung (pleural effusion).

Stage 4 lung cancer has spread to a distant part of the body, such as the liver, bones or the brain.

Revised Lung Cancer Staging System

Introduction to the revised system

There are different systems for staging lung cancer. This page is about an updated version of the most widely used system (introduced in 2009). This new system will help doctors to plan the best treatment for people with lung cancer. It can also help to give an idea of the likely outcome of treatment. It can be used for both of the main types of primary lung cancer: small cell and non-small cell.

If you've already been told the stage of your lung cancer it might help to check with your doctors whether they've used the new system or the previous one.

The TNM system

The TNM staging system is used worldwide. It can be used for different types of cancer.

- T refers to the size of the primary tumour – where the cancer first starts in the body
- N refers to which lymph nodes are affected, if any
- M refers to metastatic disease – the cancer has spread to other parts of the body.

Different sorts of cancer behave differently, so the TNM staging system varies slightly from one type of cancer to another. Numbers and letters may be added after the T, N and M to describe in more detail the exact size and extent of the cancer. For example, T (tumour) is usually numbered from one to four.

The new TNM system for lung cancer is quite complicated. Don't worry if it doesn't make sense straight away or if you have to re-read it a few times. Your doctors can help you to understand what it might mean for you.

The TNM system for lung cancer has been revised so that the size of tumour of lung cancer in different TNM staging system is:

- **T1a:** The cancer measures 2cm or less across.
- **T1b:** The cancer measures between 2 and 3cm across.

- **T2a:** The cancer measures between 3 and 5cm across.
- **T2b:** The cancer measures between 5 and 7cm across.

Note: Any T2 tumour may also affect the main airway (bronchus), or the membrane covering the lung (pleura), or the lung may be partially collapsed.

- **T3:** The tumour measures over 7cm
 - or the tumour has spread to: the chest wall, or the muscle separating the chest and the abdomen (diaphragm), or the covering

- membrane in the middle of the chest (mediastinal pleura), or the phrenic nerve, or the outer covering of the heart (pericardium), or the main airway (bronchus)
 - or the lung has completely collapsed
 - or there are two or more tumours in the same lobe of the lung.
- **T4:** The tumour is any size that has spread to the central area of the chest (mediastinum), the heart, a major blood vessel, the windpipe (trachea), the nerve which controls the voice box, the gullet (oesophagus), a spinal bone, or the main bronchus where it divides.

Lymph nodes (See Figure above: "The lungs and surrounding structure")

- **N0:** There is no cancer in the lymph nodes.
- **N1:** There are cancer cells in the nearby lymph nodes in the same side of the chest as the cancer.
- **N2:** There are cancer cells in lymph nodes in the centre of the chest (still on the same side) or in the nodes under where the windpipe (trachea) divides into the left and right bronchus.
- **N3:** There are cancer cells in lymph nodes on the opposite side of the chest or the nodes at the top of the lungs or by the collar bone.

Metastases

- **M0:** The cancer hasn't spread to anywhere else in the body.
- **M1:** The cancer has spread to the opposite lung; the person has fluid around the lungs (malignant pleural effusion) or heart (malignant pericardial effusion), which contains cancer cells (M1a) or the cancer has spread to other parts of the body (M1b).

The number system

The T, N and M stages are often grouped together to make a number stage. So a cancer may also be given a stage from Stage 1 to Stage 4. These stages may also have letters to describe the stage more accurately. Different combinations of T, N and M make up the different stages and the same stage may have more than one description.

The new lung cancer stages, in the Revised Lung Cancer Staging System are:

Stage	Tumour	Lymph nodes	Metastases
Stage 1A	T1a or T1b	N0	M0
Stage 1B	T2a	N0	M0
Stage 2A	T1a or T1b or T2a	N1	M0
	T2b	N0	M0
Stage 2B	T2b	N1	M0
	T3	N0	M0
Stage 3A	Any T between T1a and T3	N2	M0
	T3	N1	M0
	T4	N0 or N1	M0
Stage 3B	T4	N2	M0
	Any T between T1a and T4	N3	M0
Stage 4	Any T	Any N	M1a or M1b

We hope this information has helped you to understand the new lung cancer staging system. Remember, your doctor or any of your healthcare team will be able to answer any questions you may have about your particular situation. You can also talk to one of our cancer support specialists].

Treatments for Lung Cancer

Treatment Overview

Surgery, radiotherapy and chemotherapy may be used separately or together to treat people with lung cancer. This booklet discusses separately the treatments for small cell lung cancer and non-small cell lung cancer. This is because they can be quite different.

Your doctor will plan your treatment by taking into account a number of things, including:

- your general health
- the type of lung cancer (small cell or non-small cell)
- the size and position of the tumour
- whether it has spread beyond the lung (the stage of the cancer).

If you have any questions about your treatment, don't be afraid to ask your doctor or the nurse looking after you. It often helps to make a list of questions, and to take a friend or relative with you.

Treatment for Small cell lung cancer

Chemotherapy is the main treatment for people with small cell lung cancer. In many people, chemotherapy will enable them to live for longer, with better control of symptoms. Chemotherapy may be given on its own, or before radiotherapy. Sometimes chemotherapy and radiotherapy are given at the same time; this is known as **chemoradiation**.

Surgery is not usually used to treat people with small cell lung cancer, except if the cancer is found very early. This is because the cancer has usually spread to other parts of the body before being diagnosed, even if it can't be seen on a scan.

If an operation is possible, chemotherapy or radiotherapy may be given after surgery to help reduce the risk of the cancer coming back. Giving treatment in this way is known as **adjuvant** treatment.

The scans and tests you had to diagnose the cancer may be repeated later, to see how well you are responding to treatment.

Radiotherapy is sometimes given to the head (known as **prophylactic cranial radiotherapy**) to reduce the risk of the cancer spreading to the brain. This may be done for people with small cell lung cancer, if chemotherapy has worked very well or if they have had surgery to remove the tumour.

Radiotherapy may also be used effectively in people with advanced small cell lung cancer, to relieve symptoms such as pain.

Treatment for Non-small cell lung cancer

People with non-small cell lung cancer are given different types of treatment depending on the stage of their cancer.

Stage 1 Non-small cell lung cancer can often be removed with surgery. If people have other medical problems, or are not fit enough to have surgery, radiotherapy may be given to the lung tumour instead. Chemotherapy is sometimes used after surgery (adjuvant chemotherapy), to reduce the risk of the cancer coming back. Chemotherapy is also sometimes given before surgery and/or radiotherapy. This is called neo-adjuvant chemotherapy.

Occasionally radiofrequency ablation (RFA) may be used. This is only likely to be suggested if other treatments are not suitable for you. RFA is only available at some cancer centres.

Stage 2 It may be possible to remove stage 2 non-small cell lung cancer with surgery. Radiotherapy may be used for people who are not fit enough for surgery or choose not to have it. Chemotherapy is often given following surgery or radiotherapy, to reduce the risk of the cancer coming back.

Stage 3 Non-small cell lung cancer can sometimes be removed with surgery, although this is often not possible because it may have spread too far. Chemotherapy, either on its own or combined with radiotherapy, may sometimes be given before an operation (neo-adjuvant treatment). If surgery is not possible, radiotherapy can be given instead. Sometimes chemotherapy given on its own, or in combination with radiotherapy, will be the only treatment used.

Stage 4 If non-small cell lung cancer has spread to other parts of the body, or is affecting more than one lobe of the lung, radiotherapy may be used to shrink the cancer and reduce symptoms. Sometimes chemotherapy may be given before or after the radiotherapy and may shrink the cancer and improve well-being for some people. The aim is to control symptoms and maintain a good quality of life for as long as possible. Radiotherapy may also be very effective in relieving symptoms.

How treatment is planned

If your tests show that you have lung cancer, you will be looked after by a **multidisciplinary team**. This is a team of staff who specialise in treating lung cancer and in giving information and support. It will normally include:

- surgeons who are experienced in lung surgery
- specialist nurses who are experienced in the treatment and care of people with lung cancer
- oncologists – doctors who have experience in lung cancer treatment using chemotherapy, radiotherapy and other cancer treatments
- radiologists who help to analyse x-rays and scans
- pathologists who advise on the type and extent of the cancer.

Other staff will also be available to help you if necessary, such as:

- physiotherapists
- counsellors and psychologists
- social workers.

Together they will be able to advise you on the best course of action and plan your treatment, taking into account a number of factors. These include your age, general health, the type of lung cancer and the stage.

If two treatments are equally effective for your type and stage of cancer your doctors may offer you a choice of treatments. Sometimes people find it very hard to make a decision. If you are asked to make a choice, make sure that you have enough information about the different treatment options, what is involved, and the side effects you might get, so that you can decide on the right treatment for you.

Remember to ask questions about anything that you don't understand or feel worried about. You may find it helpful to discuss the benefits and disadvantages of each option with your doctor, or specialist nurse.

Giving your consent

Your doctor will explain the aims of any treatment before you have it. They will usually ask you to sign a form saying that you give your permission (consent) for the hospital staff to give you the treatment. No medical treatment can be given without your consent, and before you are asked to sign the form you should be given full information about:

- the type and extent of the treatment you are advised to have
- the advantages and disadvantages of the treatment
- any other treatments that may be available
- any significant risks or side effects of the treatment.

If you don't understand what you have been told, let the staff know straight away so that they can explain again. Some cancer treatments are complex, so it's not unusual for people to need repeated explanations.

It's often a good idea to have a friend or relative with you when the treatment is explained, to help you remember the discussion more fully. You may also find it useful to write down a list of questions before you go to your appointment.

People often feel that hospital staff are too busy to answer their questions, but it's important for you to be aware of how the treatment is likely to affect you. The staff should be willing to make time for you to ask questions.

You can always ask for more time if you feel that you can't make a decision when the treatment is first explained to you.

You are also free to choose not to have the treatment. The staff can explain what may happen if you don't have it. It is essential to tell a doctor or the nurse in charge, so that they can record your decision in your medical notes. You don't have to give a reason for not wanting to have treatment, but it can be helpful to let the staff know your concerns so that they can give you the best advice.

Benefits and disadvantages

Many people are frightened at the idea of having cancer treatments, because of the side effects that can occur. Although many of the treatments can cause side effects, these can usually be controlled with medicines.

Treatment can be given for different reasons, and the potential benefits will vary depending on the individual situation. In people with early-stage lung cancer, surgery can sometimes be done with the aim of curing the cancer. Occasionally, additional treatments are also given to reduce the risk of it coming back.

If the cancer is at a more advanced stage the treatment may only be able to control it, reducing symptoms and helping to improve quality of life. For some people in this situation however, the treatment will have no effect upon the cancer, and they will go through the treatment's side effects with little benefit.

Treatment decisions

If you've been offered treatment that aims to cure your cancer, deciding whether to accept the treatment may not be difficult. However, if a cure is not possible and the treatment is being given to control the cancer for a period of time, it may be more difficult to decide whether to go ahead with it.

Making decisions about treatment in these circumstances is always difficult, and you may need to discuss in detail with your doctor whether you wish to have treatment. If you choose not to, you can still be given supportive care (also known as palliative care) with medicines to help control any symptoms. Some cancer treatments, such as radiotherapy, can also be used to help treat symptoms.

Second opinion

Usually, a number of cancer specialists work together as a team and they use national treatment guidelines to decide on the most suitable treatment for each person. Even so, you may want to have another medical opinion. Either your specialist or GP can refer you to another specialist for a second opinion, if you feel it will be helpful. Getting a second opinion may cause a delay to the start of your treatment, so you and your doctor need to be confident that it will give you useful information.

If you go for a second opinion, it may be a good idea to take a friend or relative with you, and to have a list of questions ready so that you can make sure your concerns are covered.

Surgery for lung cancer

The operation

Surgery is most commonly used for non-small cell lung cancers that are small in size and haven't spread. Before any operation you may need to have further tests to assess your ability to cope with the surgery.

There are three main types of surgery for lung cancer; lobectomy, pneumonectomy and wedge resection. The type of operation will depend upon the size and position of the tumour.

Removal of a lobe of the lung, as shown in the diagram below, is called a **lobectomy**. Removal of two lobes is called a **bi-lobectomy**.

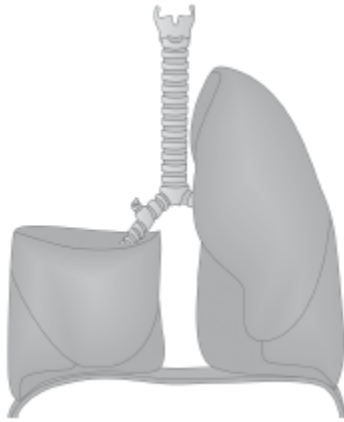


Figure: Lobectomy

Removal of a whole lung, as shown below, is called a **pneumonectomy**.

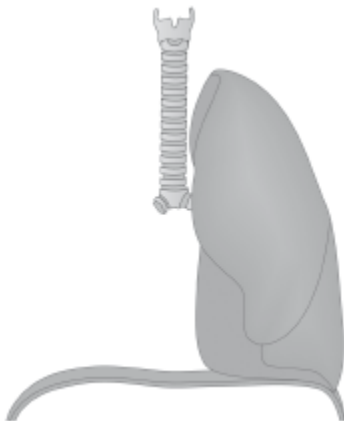


Figure: Pneumonectomy

Occasionally, in people who have very early lung cancer, a very small amount of the lung is removed. This is called a **wedge resection** (shown below).

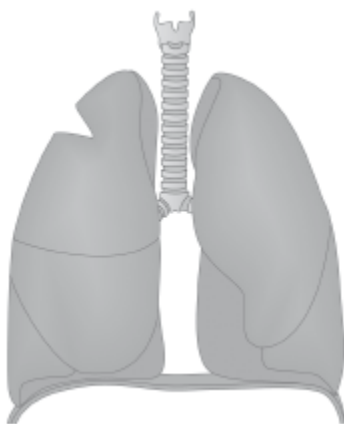


Figure: Wedge Resection

A segmentectomy operation removes a slightly larger part of the lung. These operations are not done very often.

People are often worried that they won't be able to breathe properly if their lung has been removed. However, it's quite possible to breathe normally with only one lung. People who had breathing difficulties before the operation may continue to be breathless afterwards. Breathing tests, to measure how well your lungs work, will be done to help you and your doctor to decide whether an operation is right for you.

Before any operation, make sure that you have discussed it fully with your doctor so that you understand what it involves.

Surgery is sometimes combined with radiotherapy or chemotherapy.

After your operation

It can take many weeks to recover fully from a lung operation, although some people recover more quickly than others. There are things you can do to help speed up your recovery. After your operation you will be encouraged to start moving about as soon as possible. This is an essential part of your recovery. Even if you have to stay in bed, it's important to keep up regular leg movements to help your circulation and prevent blood clots. A physiotherapist will visit you regularly on the ward to help you with breathing exercises to prevent chest infections and other possible complications.

X-rays will be taken regularly to make sure your lung is working properly.

Drips and drains

A drip (intravenous infusion) will be used to give you fluids for a couple of days, until you're able to eat and drink normally again.

You will also have drainage tubes in your wound. These are usually taken out about 2–7 days after your operation, depending on your recovery. The wound will usually be around the side of your chest between two ribs. It will be covered by a dressing, which the nurses will check.

Pain

It is quite normal to have some pain or discomfort after your operation. This can usually be controlled with painkillers. Let your doctor or one of the nurses know if you have any pain, so they can treat it as soon as possible. It's important to be as comfortable as possible so that you can breathe properly. This can reduce your risk of developing chest infections.

Mild discomfort or pain in your chest can last for several weeks, and you will be given some painkillers to take home with you. Some people find that they have pain that starts some weeks or months after their operation. This is usually because nerve endings which have been damaged during the operation have started to grow back. Talk to your specialist if you start to have pain some time after your operation.

Going home

You will probably be ready to go home about 5–10 days after your operation. If you think that you might have problems when you go home – if you live alone, for example, or have several flights of stairs to climb – it's important to tell one of the nurses or the hospital social worker when you're admitted to the ward.

They can arrange for help when you go home. When you go home, you will need to exercise gently to build up your strength and fitness. It's a good idea to check with your doctor or physiotherapist which types of exercise would be suitable for you. Walking and swimming are good exercises that are suitable for most people after treatment for lung cancer.

Radiotherapy for lung cancer

Radiotherapy treats cancer by using high-energy x-rays to destroy the cancer cells, while doing as little harm as possible to normal cells. The treatment is given in the hospital radiotherapy department. The number of treatments you have, and the length of time they take, will depend on the type of cancer as well as its size and position.

When it is given

Radiotherapy is usually given by aiming high-energy x-rays at the lung from a radiotherapy machine. This is known as external beam radiotherapy.

Radical radiotherapy: Radiotherapy can be given with the aim of curing the cancer (radical radiotherapy). This may be instead of surgery. There are different ways of having radical radiotherapy.

You may have treatment every week day with a rest at the weekend. The treatment will be given for 3–7 weeks.

Sometimes radical radiotherapy will be given using CHART (**C**ontinuous **H**yperfractionated **A**ccelerated **R**adiotherapy). The dose of radiotherapy is divided so that more than one treatment, or fraction, is given each day. People having CHART are given treatment every day, including weekends, until the course is over. The course usually lasts 12 days.

Palliative radiotherapy: Radiotherapy may also be used to control symptoms (palliative radiotherapy). Often only one or two treatments are given. Sometimes a higher dose of radiotherapy is given over two weeks if the doctor thinks this may be helpful. Treatment is given each weekday with a rest at the weekend.

Sometimes a type of internal radiotherapy called **endobronchial radiotherapy** or **brachytherapy** may be used. This type of radiotherapy may be given when the tumour is blocking one of the airways and has made the lung collapse. It is a simple way of opening up the airway. If you have this type of radiotherapy, you usually need only one session of treatment.

External radiotherapy

To make sure that the radiotherapy works as well as possible, it has to be carefully planned. Before you start your treatment you will have pictures taken with a special CT scanner and measurements will be taken by the therapy radiographers. The information will be used to work out the details of your radiotherapy. Treatment planning is a very important part of radiotherapy, and it may take a couple of visits. The doctor who plans and supervises your treatment is known as a clinical oncologist.

Marks may be drawn on your skin to help the radiographer (who gives you your treatment), to position you accurately and to show where the rays are to be directed. It's important not to wash or rub them off until the treatment is finished. Occasionally, tiny permanent marks (tattoos) are made on the skin in case further treatment is needed later. At the beginning of your radiotherapy you will be given instructions on how to look after your skin in the area to be treated.

Before each session of radiotherapy the radiographer will position you carefully on the couch, either sitting or lying, and make sure that you are comfortable. During your treatment you will be left alone in the room, but you will be able to talk to the

radiographer who will be watching you. Radiotherapy is not painful and only takes a few minutes, but you do have to stay still while the treatment is being given.



Figure: The radiographer watches on a monitor while treatment is given.

Radiotherapy to the brain

Some people with small cell lung cancer are given radiotherapy to the brain. This is because there is a risk that the cancer cells will spread to the brain. Giving radiotherapy in this way is known as prophylactic cranial radiotherapy (PCR).

A soft clamp is used to hold your head still to make sure that the correct area of the head is treated. Sometimes a see-through plastic mask is made to help keep your head in the right position during treatment. PCR is usually given daily, Monday to Friday. The number of sessions will vary depending on the individual situation.

Internal radiotherapy

If you are having endobronchial radiotherapy, a thin tube (catheter) will be temporarily put inside your lung using a bronchoscope. Then a small piece of solid radioactive material (the source) will be placed inside this tube, next to the tumour.

The radiotherapy is delivered directly to the tumour and healthy tissue will only be slightly affected. The source is left in place for a few minutes to give the treatment. The source and catheter are then removed. The treatment can be repeated two or three times, depending on the dose of radiotherapy you need.

Side effects of Radiotherapy

Radiotherapy can cause general side effects, such as tiredness. It can also cause chest pain or a few days of flu-like symptoms. You may notice that you develop a cough and produce more sputum (phlegm), which may have flecks of blood in it. This is quite normal. These side effects can be mild or more troublesome, depending on the strength of the radiotherapy dose and the length of your treatment. Your radiotherapist will be able to advise you about what to expect.

Problems with swallowing

After two to three weeks of treatment, the main problem you are likely to notice is difficulty in swallowing. This may be very uncomfortable. You may also have heartburn and indigestion. This happens because the radiotherapy can narrow your gullet (oesophagus). Tell your doctors if you have problems swallowing, as they can give you medicines to help. If you don't feel like eating, or have problems with swallowing, you can replace meals with nutritious, high-calorie drinks. These are available from most chemists and can be prescribed by your GP. Our booklet on diet has some helpful hints on how to eat well when you are feeling ill.

Tiredness

Radiotherapy can make you feel tired, so try to get as much rest as you can, especially if you have to travel a long way for treatment each day.

Skin care

Some people develop a skin reaction similar to sunburn. Pale skin may become red and sore or itchy; darker skin may develop a blue or black tinge. You will be given advice on how to look after your skin by the radiographer giving your treatment.

Hair loss

External radiotherapy will make your hair fall out within the treatment area, including chest hair for men or head hair if you are given prophylactic cranial radiotherapy. The hair usually grows back, although occasionally the hair loss is permanent.

All the side effects should disappear gradually once your treatment is over, but it's important to tell your doctor if they continue.

Radiotherapy treatments for lung cancer do not make you radioactive. It is perfectly safe for you to be with other people, including children, throughout treatment.

Long-term side effects of Radiotherapy

Very rarely radiotherapy for lung cancer can cause long-term side effects such as inflammation, or hardening and thickening (fibrosis) of the lungs. This can cause symptoms such as shortness of breath and a cough. The gullet (oesophagus) may also be affected and become narrower, making swallowing difficult. The bones in the chest area may become thinner and more brittle.

Long-term side effects are very rare, but it's important that you are aware of them so that you can seek medical advice if you notice any symptoms.

CHART radiotherapy for non-small cell lung cancer

CHART is a particular way of giving radiotherapy. The initials stand for **C**ontinuous **H**yperfractionated **A**ccelerated **R**adiotherapy. CHART may be given to some people with a type of lung cancer called non-small cell lung cancer (NSCLC).

Studies have shown that CHART may work better for some people with inoperable non-small cell lung cancer (NSCLC) than standard daily radiotherapy does.

How CHART works?

Radiotherapy is the use of x-rays and similar rays (such as electrons) to treat disease. It works by damaging DNA (our genetic material) in the cancer cells. By damaging the DNA, the cancer cells are no longer able to divide and grow.

Each radiotherapy treatment is called a fraction. In standard radiotherapy for lung cancer, one fraction or treatment is given daily from Monday to Friday – usually for several weeks. In CHART, more than one fraction is given each day (hyperfractionation). Reducing the time between fractions means that there is less time between treatments for the fast growing cancer cells to recover.

Unlike standard radiotherapy, where there is a break from treatment at the weekend, people having CHART are given treatment every day including weekends. A modified type of CHART, called CHARTWEL, gives a break at the weekend.

In CHART, the number of treatments will be about the same as standard radiotherapy but the course will be completed sooner (accelerated treatment). The total dose of radiotherapy is similar to that given with standard radiotherapy.

When CHART is used?

At the moment, CHART radiotherapy is only available in some hospitals. Where it is available, it can be offered in particular situations to people with certain stages of NSCLC. The stage of a cancer is a term used to describe its size, position and whether it has spread beyond where it started in the body.

CHART radiotherapy can be offered to people with stage 1 and 2 NSCLC whose tumour can't be operated on, or who can't (or don't want to) have surgery. It can also be given to those with stage 3A or 3B NSCLC who aren't fit enough (or don't want) to have both chemotherapy and radiotherapy.

Stage 1A – the cancer is no bigger than 3cm (1¼in) in size.

Stage 1B is when either:

- the cancer is larger than 3cm
- the cancer is growing into the main airway of the lung (bronchus)
- the cancer has spread into the inner covering of the lung (pleura).

Stage 2A the cancer measures 3cm (1¼in) or less in size and nearby lymph nodes are affected.

Stage 2B is when either:

- the cancer is larger than 3cm (1¼in) and in the nearby lymph nodes, there is no cancer in the lymph nodes, but the tumour has grown into the chest wall, the outer covering of the lung (pleura), or the muscle layer below the lungs (diaphragm).

Stage 3A is when either:

The cancer is of any size and has spread into the lymph nodes in the middle of the chest (mediastinum), but not to the other side of the chest.

The cancer has spread into tissue around the lung near to where it started. This can be into the:

- chest wall
- the covering of the lung
- the middle of the chest (mediastinum)
- other lymph nodes close to the affected lung.

Stage 3B is when either:

- the cancer has spread to lymph nodes on either side of the chest or above the collar bone
- the cancer has spread into another important area; such as the gullet (oesophagus), the heart, windpipe or a main blood vessel
- there are two or more tumours in the same lung
- there is a collection of fluid around the lung, containing cancer cells.

Sometimes it is not possible to give CHART; for example if the tumour is too near the spinal cord, or if the tumour and affected lymph nodes are too far apart.

How CHART radiotherapy is given?

Treatment planning

To make sure that the radiotherapy works as well as possible, it has to be carefully planned. On your first few visits to the radiotherapy department, you will be asked to lie under a machine called a simulator. This takes x-rays of the area to be treated. Sometimes, a CT scanner can be used for the same purpose. Treatment planning is a very important part of radiotherapy, and it may take a couple of visits.

Pinprick 'tattoos' or marks may be drawn on your skin to help the radiographer, who gives you your treatment, to position you accurately, and to show where the rays are to be directed. These marks are often permanent because they must remain visible throughout your treatment, but occasionally they can be washed off once your radiotherapy is finished. At the beginning of your treatment, you will be given instructions on how to look after your skin.

CHART treatment

Before each session of radiotherapy, the radiographer will position you carefully lying on the couch and make sure that you are comfortable. You will be left alone in the room during your treatment (which only takes a few minutes), but will be able to talk to the radiographer, who will be watching you from the next room. Radiotherapy is not painful, but you do have to stay still for a few minutes while the treatment is being given.

A typical schedule would be to give treatment three times a day for 12 days in a row, including the weekends. Each treatment has to be given at least six hours apart. This is to allow the normal cells which have suffered damage to recover between treatments. This reduces the chance of long-term damage to normal tissues.

The first treatment is given early in the morning (about 8am) followed by one around lunchtime (about 2pm) and another in the early evening (about 8pm). This means that people usually have to stay in the hospital, or nearby, while having their radiotherapy.

Possible side effects of CHART radiotherapy

Giving radiotherapy over two weeks should allow the radiotherapy to be completed before side effects develop. However, there are a few side-effects which may develop towards the end of treatment or after it is finished.

Problems with swallowing: The main side effect of CHART is a sore gullet (oesophagitis). This may make swallowing more difficult. You might also have heartburn or indigestion if the gullet is narrowed during treatment. This tends to develop towards the end of treatment and may be at its worst during the first few weeks after treatment before gradually improving.

Let your doctor know if you're having problems swallowing, as they can give you medicine to help. Some liquid medicines may be helpful as they create a protective layer over sore areas and soothe the lining of the gullet. If you don't feel like eating, or have problems swallowing, you can replace meals with thick fluids (such as soups and puddings) or nutritious, high-calorie drinks. These drinks are available from most chemists and can be prescribed by your GP.

Tiredness: You may find that you feel tired during your radiotherapy. This may get worse as you go through treatment, but should improve over the first few weeks and months after it finishes. Pay attention to how you feel, and if necessary, allow yourself extra time to rest, perhaps by taking a nap in the afternoons.

Cough: Radiotherapy may irritate the chest. This means you may develop a cough during or after your treatment. You can ask your doctor for something to help with this. It usually improves when the treatment finishes.

Breathlessness: This may get slightly worse during treatment but usually improves when treatment is finished.

If you have any breathing problems which get worse after finishing your treatment it's important to let your doctors at the hospital know as soon as possible. This is because it could be due to inflammation of the lungs (known as pneumonitis) which may need immediate treatment.

Skin reaction: Some people may also find that they get a mild skin reaction (like mild sunburn) on the area being treated, although this is unusual. You will be given advice on how to look after your skin by the radiographer giving your treatment.

Long-term side effects of CHART radiotherapy

Lung fibrosis: Radiotherapy can cause some damage to the normal lung tissue around the tumour. This can sometimes result in scarring of the lung (fibrosis) which develops between 6–9 months after radiotherapy and can cause breathlessness.

The frequency of lung fibrosis is slightly higher in people having CHART radiotherapy compared to those having standard radiotherapy treatment.

Your feelings

You may have many different emotions, including anxiety and fear. These are normal reactions and are part of the process many people go through in trying to come to terms with their condition.

Everybody has their own way of coping with difficult situations; some people find it helpful to talk to friends or family, while others prefer to seek help from people outside their situation. Some people prefer to keep their feelings to themselves. There is no right or wrong way to cope, but help is available if you need it.

Chemotherapy for lung cancer

Chemotherapy is the use of anti-cancer (cytotoxic) drugs to destroy cancer cells. The chemotherapeutic drugs work by disrupting the growth of cancer cells.

How chemotherapy is given?

There are over 60 different chemotherapy drugs. Those most commonly used to treat lung cancer include cisplatin, carboplatin, gemcitabine (Gemzar®), vinorelbine (Navelbine®), paclitaxel (Taxol) and docetaxel (Taxotere®).

The drugs are often given in combination. For example:

- carboplatin and Taxol
- vinorelbine and cisplatin or carboplatin
- gemcitabine with cisplatin or carboplatin
- MIC (mitomycin, ifosfamide and cisplatin)
- EC (etoposide and carboplatin or cisplatin).

The drugs are given by injection into a vein (intravenously), or sometimes as tablets. Each cycle of chemotherapy may last a few days. After having chemotherapy you will have a rest period of a few weeks, which allows your body to recover from any side effects of the treatment. The number of sessions you have will depend on the type of cancer you have and how well it is responding to the treatment.

Chemotherapy may be given to you in the outpatient department, or as tablets to take at home, but sometimes you will need to spend a night or two in hospital.

Doctors are always looking to improve the treatment of lung cancer, so you may be asked to take part in a clinical trial.

Side effects of Chemotherapy

Chemotherapy can cause unpleasant side effects. However, many people have few side effects, and those that occur can often be well controlled with medicine. The main side effects are described here, along with some of the ways they can be reduced.

Lowered resistance to infection: Chemotherapy can reduce the production of white blood cells by the bone marrow, making you more likely to get an infection. This effect can begin seven days after treatment and your resistance to infection usually reaches its lowest point 10–14 days after chemotherapy. Your blood cells will then increase steadily and will usually have returned to normal before your next course of chemotherapy is due.

Contact your doctor or the hospital straight away if:

- Your temperature goes above 38°C (100.5°F)
- You suddenly feel unwell (even with a normal temperature).

You will have a blood test before each cycle of chemotherapy, to make sure that your blood cells have recovered. Occasionally it may be necessary to delay your treatment if your blood count is still low.

Bruising or bleeding: The chemotherapy can also reduce the production of platelets, which help the blood to clot. Let your doctor know if you have any unexplained bruising or bleeding, such as nosebleeds, blood spots or rashes on the skin, or bleeding gums.

Anaemia (low number of red blood cells): While having chemotherapy, you may become anaemic. This may make you feel tired and breathless.

Feeling sick: Some of the drugs used to treat lung cancer may cause nausea (feeling sick) and vomiting. There are now very effective anti-sickness drugs (anti-emetics) to prevent or reduce nausea and vomiting. Your doctor will prescribe these for you.

Sore mouth: Some chemotherapy drugs can make your mouth sore and cause mouth ulcers. Regular mouthwashes can help to keep your mouth clean and relieve any soreness. Your nurse will show you how to use these properly. If you don't feel like eating, you could try a diet of soft food or replacing some meals with nutritious drinks. Our booklet on eating well might be of some help.

Hair loss: Hair loss is another common side effect of some – but not all – chemotherapy drugs. Ask your doctor if the drugs you are taking are likely to make your hair fall out. Most patients are entitled to a free wig from the NHS and your doctor or nurse will be able to arrange for a wig for you. Some people prefer to use hats or scarves rather than a wig. If your hair does fall out, it will grow back over a period of 3–6 months.

Tiredness: You may feel tired and have a general feeling of weakness. It is important to allow yourself plenty of time to rest.

Although they may be hard to bear at the time, these side effects will gradually disappear once your treatment is over.

Chemotherapy affects people in different ways. Some find they are able to lead a fairly normal life during their treatment, but many find they become very tired and have to take things much more slowly. Just do as much as you feel like and try not to overdo it.

Treating Lung Cancer with Cancer growth inhibitors

There are structures on the surface of many types of cancer cells, known as epidermal growth factor receptors (EGFRs). The receptors allow epidermal growth factor (a particular protein present in the body) to attach to them. When epidermal growth factor (EGF) attaches to the receptor, it causes chemical processes to occur inside the cell that make it grow and divide more quickly.

Drugs known as EGFR antagonists attach themselves to the EGF receptor inside the cell, and prevent the receptor from being activated. This can help to stop the cancer cells from growing so quickly.

Erlotinib (Tarceva®), is an EGFR (epidermal growth factor receptor) antagonist. It is sometimes used to treat people with non-small cell lung cancer whose cancer has come back after initial treatment, or has not responded to at least one course of chemotherapy. Erlotinib is given as a tablet. Side effects are generally mild and can include diarrhoea, a rash, nausea and tiredness.

The National Institute for Health and Clinical Excellence (NICE) in the UK is an independent body that was set up by the government. NICE assesses medicines and treatments and gives guidance to doctors on how they should be used in the NHS in England and Wales. The equivalent body in Scotland is the Scottish Medicines Consortium (SMC).

In November 2008 NICE assessed the use of erlotinib in the NHS. It recommends that erlotinib can only be used as an alternative to docetaxel, in people with non-small cell lung cancer who have already tried one chemotherapy course that has not worked. It can only be used if the drug company supplies it at the same cost as that of docetaxel. However, people who were already having erlotinib before the guidance from NICE came out can continue to have it.

In Scotland, erlotinib can be given to people with advanced non-small cell lung cancer who have had at least one course of chemotherapy.

Treating Lung Cancer with Radiofrequency ablation

Radiofrequency ablation uses heat to destroy cancer cells. A doctor will place a needle into the lung tumour. This is usually done using a CT scanner to make sure the needle is in the right place. Radiowaves are then passed down the needle into the tumour to heat, and so destroy, the cancer cells.

This treatment is usually only used when a person has a very early stage cancer and other treatments are not suitable.

There are very few side effects with this treatment although it is quite common for people to have some pain or discomfort and to feel tired. You usually need to stay in hospital overnight with this treatment.

Newer treatments for lung cancer

Cryosurgery

Cryosurgery, or cryotherapy, uses extreme cold to freeze and destroy cancer cells. Using a bronchoscope, the doctor puts an instrument, called a cryoprobe, close to the tumour. Liquid nitrogen is then circulated through the probe to freeze the tumour. Cryosurgery is still a relatively new treatment for lung cancer, and is not widely available in the UK.

Diathermy

Diathermy, which is sometimes known as electrocautery, uses an electrical current passed through a needle, to destroy cancer cells.

Photodynamic therapy (PDT)

Photodynamic therapy (PDT) uses laser, or other light sources, combined with a light-sensitive drug (sometimes called a photosensitising agent) to destroy cancer cells. The light-sensitive drug is given as a liquid into a vein. After waiting for the drug to be taken up by the cancer cells, the laser light is directed at the tumour using a bronchoscope.

PDT will make you temporarily sensitive to light and you will need to avoid bright light for between a couple of days and a few months, depending upon the photosensitising drug that is used. Other side effects include swelling, inflammation, breathlessness and a cough.

PDT is still being researched as a treatment for advanced lung cancer and is not suitable for everyone. It can also be used if the cancer is just growing into the wall of one of the main airways (endobronchial cancer) and is at a very early stage. Your doctor can give you more information. PDT is only available at some centres.

Antiangiogenesis drugs

Angiogenesis is the medical term for the growth of new blood vessels. Tumours need their own blood supply in order to grow. Drugs are available which can help stop the development of new blood vessels – these are known as antiangiogenesis drugs. They include bevacizumab (Avastin®) and thalidomide. Both these drugs are being studied to see if they may help people with lung cancer.

Controlling symptoms of lung cancer

Apart from the symptoms which led you to see your doctor in the first place, new symptoms can sometimes develop during your illness, such as breathlessness or a cough. These may be caused by the growth or spread of the lung cancer to other parts of the body, but they may have another cause. For example, some lung cancer cells produce hormones which can upset the body's chemical balance. If you have any new symptoms, tell your doctor straight away so that you can be given treatment for them, or perhaps be reassured that they are nothing to worry about.

Occasionally, cancer in the lung can cause fluid to build-up between the layers that cover the lung (pleural effusion). Your doctor can usually drain the fluid by inserting a

needle (cannula), into the area. The needle is attached to a tube and the fluid passes into a drainage bag or bottle.

Some people with lung cancer have pain. This can usually be well controlled using painkillers and other methods of pain control. People may have pain if the cancer has spread to the bones. A study is looking at the use of a drug, ibandronate, with radiotherapy to see if it helps relieve bone pain.

In addition to treatments already mentioned in this booklet, there are some other treatments that can be given to help relieve symptoms.

- Laser therapy
- Airway stents
- Blood vessel stents

Laser therapy

Sometimes, lung cancer causes breathlessness by blocking the windpipe (the trachea), or one of the main airways that take air from the windpipe into the lungs. If the blockage is caused by a tumour within the airway, it can often be relieved by laser therapy, which burns the tumour out of the airway. Laser therapy does not destroy the tumour completely, but it can help to reduce or get rid of the symptoms.

Laser therapy is usually carried out under a general anaesthetic. While you are asleep, a bronchoscopy will be done, and a flexible fibre is passed through the bronchoscope to aim the laser beam at the tumour. The laser beam burns away as much of the tumour as possible. The bronchoscope is removed, and you are brought round from the anaesthetic. Usually the anaesthetic is a liquid given into a vein, and recovery from it is very quick.

There are not usually any side effects from laser therapy. If the treatment has been straightforward you may be able to go home the same evening or, more often, the next day. If you have had an infection in your lung, it may be necessary for you to stay in hospital for a few days for antibiotic treatment and physiotherapy.

If the blockage in the airway comes back, laser treatment can be used again. Sometimes radiotherapy is given as well, to try to make the relief given by the laser therapy last longer.

Airway stents

Sometimes an airway can become blocked by pressure on it from the outside, which makes it close. This can sometimes be relieved using a small device, called a stent, which is put inside the airway to hold it open. The most commonly used stent is a small wire frame. It is inserted through a bronchoscope in a folded up position and as it comes out of the end of the bronchoscope it opens up, like an umbrella. This pushes the walls of the narrowed airway open.

Airway stents are usually put in under a general anaesthetic. When you wake up you will probably not be able to feel that it is there, but you will be able to breathe more easily. The stent can stay in your lung permanently and should not cause any problems.

Blood vessel stents

Stents may also be used if a large blood vessel, called the superior vena cava, has become blocked by the cancer, causing a feeling of pressure in the upper body. This can usually be relieved by radiotherapy, or by putting a stent in the blood vessel to keep it open. In this case the stent is a small tube which is inserted through a small cut in the groin and passed up through the blood vessels to the chest. The stent can usually be put in under local anaesthetic, while you are awake.

Follow-up after treatment for lung cancer

Your doctor will probably want you to have regular check-ups and x-rays. This is a good time to discuss with your doctor any problems you may have. If you have any problems, or notice any new symptoms in between these appointments, let your doctor know as soon as possible.

For people whose treatment is over apart from regular check-ups, JASCAP booklet on adjusting to life after cancer gives useful advice on how to keep healthy and adjust to life after cancer.

Secondary cancer in the lung

This information is about secondary cancer in the lung. The term “secondary cancer in the lung” describes the situation where cancer cells have spread to the lungs from a cancer that began elsewhere in the body. The original cancer is described as a primary cancer, and when it spreads this is referred to as secondaries or metastases.

The lungs

The lungs are a pair of organs in the chest that are responsible for breathing. When you breathe in, air passes from your nose or mouth, through the windpipe (trachea) and into one of the two airways (bronchi) which enter the lungs. These airways divide to form smaller tubes, at the end of which are millions of tiny sacs. It is here that oxygen is absorbed from the air, and passes into the bloodstream to be circulated around the body. The lungs are surrounded by a protective lining that consists of two membranes called the pleura.

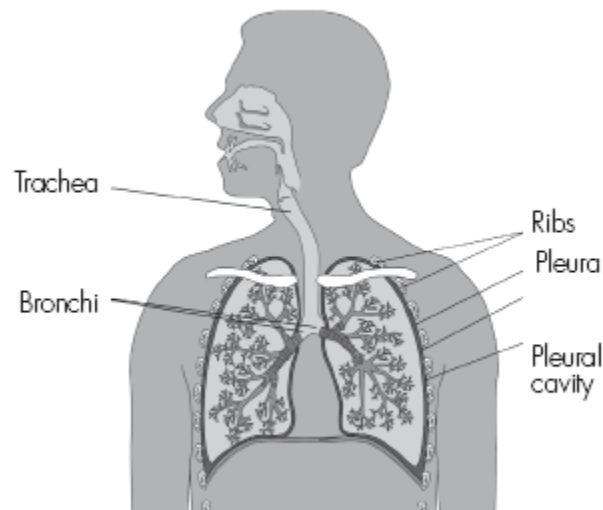


Figure: Structure of the lungs and pleura

Cancer in the lung

Cancer can develop in the lungs in two ways. It can start in the lung (primary lung cancer), or it can spread there from a primary cancer elsewhere in the body. If a cancer spreads to the lungs from another part of the body, this is known as **secondary** or **metastatic** lung cancer.

Cancerous tumours are made up of millions of cells. Some of these cells may break away from the primary cancer and travel in the bloodstream or the lymphatic system to another part of the body, in this case the lungs. Although any type of cancer can spread to the lung, the most common types to spread to this area are cancers of the large bowel (colon and rectum), breast, bladder, testicle, stomach, gullet (oesophagus), kidney (renal), and a type of skin cancer called malignant melanoma.

Signs and symptoms of Secondary Lung cancer

The symptoms of a secondary lung cancer may be quite distressing, and can include:

- a cough that does not clear up
- breathlessness
- coughing up blood-stained phlegm (sputum)
- pain or discomfort in the chest.

Many of these symptoms are similar to those of a primary lung cancer. They are more commonly caused by conditions other than cancer, such as a chest infection, but you should see your doctor if you have any of these symptoms. A doctor may suspect a

secondary lung cancer if there has been a previous diagnosis of cancer and you have some of these symptoms, particularly if they do not respond to other treatment such as antibiotics.

Sometimes, secondaries or metastases are found before a primary cancer has been diagnosed. Occasionally, it may not be possible to find the original cancer – this is called an 'unknown primary'.

How Secondary Lung cancer is diagnosed?

A number of tests may be done to diagnose a secondary lung cancer, including:

Chest x-ray: This may be taken to show the size and position of the cancers.

CT (computerised tomography) scan: This is a sophisticated type of x-ray that builds up a three-dimensional picture of the inside of the body. The scan is painless but takes up to 30 minutes. CT scans use a small amount of radiation, which will be very unlikely to harm you and will not harm anyone you come into contact with.

Special liquids are often used to allow particular areas of the body to be seen more clearly on the scan. They may be given as a drink or an injection, or both. You will probably be able to go home as soon as the scan is over.

MRI (magnetic resonance imaging) scan: This scan uses magnetism instead of x-rays to form a series of cross-sectional pictures of the inside of the body. During the scan, you will be asked to lie on the couch inside a metal cylinder. You will usually be given an injection of a liquid that enables the pictures to be seen more clearly. The test can take up to an hour and is completely painless. If you don't like enclosed spaces you may find the machine claustrophobic. The machine is also quite noisy, but you will be given earplugs or headphones to wear.

PET scan: This uses low-dose radioactive sugar to measure the activity of cells in different parts of the body. A very small amount of a mildly radioactive substance is injected into a vein, usually in your arm. A scan is then taken a couple of hours later. Areas of cancer are usually more active than surrounding tissue and show up on the scan.

Biopsy: Sometimes the doctors need to carry out a biopsy. This is usually done in the x-ray department, most commonly during a CT scan. A local anaesthetic is used to numb the area, before a needle is inserted to remove a small piece of tissue. The sample can then be examined under a microscope. The biopsy may be slightly uncomfortable but only takes a few minutes.

Secondary lung cancer may also cause fluid to collect in the space between the two membranes (the pleura) that surround the lungs. This is known as a pleural effusion. If this happens, it may be possible to remove some of the fluid and examine it for cancer cells.

When the cancer cells are examined, the doctors can tell that it is a secondary lung cancer because the cells look like the cells from the original cancer. For example, if a stomach cancer has spread to the lungs, the cells would look like stomach cells rather than lung cells.

Treatment of Secondary Lung cancer

The treatment for a secondary lung cancer depends on the primary cancer. Very often, chemotherapy or hormonal treatment can be given to reduce and control lung secondaries.

Surgery to remove the secondary lung cancer may be possible for a small number of people. This may be an option only if the primary cancer has been controlled and there is no evidence of the cancer having spread anywhere else in the body. It also requires the cancer to be affecting just one small part of the lungs, which is easy to get to, and not attached to important blood vessels or nerves.

A short course of radiotherapy may be given to relieve some of the symptoms of the secondary lung cancer, such as pain, breathlessness, or coughing up blood (haemoptysis).

If the cancer is causing a blockage in the windpipe or one of the large airways, **laser therapy** may be used to burn the tumour out of the airway. This may relieve some of the symptoms, though it does not destroy the cancer completely. If the cancer is causing pressure on structures close to the windpipe, a small tube called a stent may be inserted to hold the windpipe open. The stent can remain in the lung permanently and does not cause any problems.

A special form of **internal radiotherapy** called endobronchial radiotherapy, or brachytherapy, may be given when the tumour is blocking one of the airways. A thin tube (catheter) containing radioactive material is placed close to the tumour, using a thin, flexible tube used to examine the inside of the airways (bronchoscope). Usually only one session of treatment is needed.

Coping with symptoms of secondary Lung Cancer

The symptoms of a secondary lung cancer can affect a person's day-to-day life and can be distressing.

It can help to note down your main symptoms so that when you see the doctor you can discuss each in turn.

Breathlessness: This is a common and frightening problem which can affect all aspects of your life. The distress caused by being breathless can be partly relieved by medication and activities such as muscle relaxation.

Fluid on the lung: A secondary lung cancer may cause a build-up of fluid between the two membranes (the pleura) that surround the lungs. This is known as a pleural effusion. The fluid puts pressure on the lung and may cause breathlessness, a cough, and a dull aching pain. These symptoms can be relieved by carefully draining the fluid, using a syringe and needle, or a tube. Sometimes it is not possible to drain the fluid as it can collect in a number of small pockets rather than in one place. The fluid tends to build up again, so a chemical may be inserted into the space between the pleura to try to prevent it from recurring. This procedure is called **pleurodesis** and occasionally it may be done surgically for better effect. However, this is more complicated and will only be suitable for patients who are otherwise very fit.

Cough and chest pain: These can usually be relieved using medicines, which your doctor can prescribe.

Fear of choking: People who are experiencing problems with breathing may have a fear of choking. However, this is very unlikely to happen.

Coughing up blood (haemoptysis): It is not unusual to notice some streaks of blood in your phlegm if you have secondary lung cancer. If you notice larger amounts of blood, let your doctor know so they can plan specific treatment (such as radiotherapy) to control it.

Research trials for Secondary Lung Cancer

Research into treatments for secondary cancers in the lung is ongoing and advances are being made. Cancer doctors use clinical trials to assess new treatments. Before any trial is allowed to take place, an ethics committee must have approved it, and agreed that the trial is in the interest of patients.

You may be asked to take part in a clinical trial. Your doctor must discuss the treatment with you so that you have a full understanding of the trial and what it involves. You may decide not to take part, or to withdraw from a trial, at any stage. You will then receive the best standard treatment available.

Your feelings

Learning that your cancer has spread or come back may be even more devastating than hearing for the first time that you have cancer. You may have many different emotions, including anger, resentment, guilt, anxiety and fear. These are all normal reactions, and are part of the process many people go through in trying to come to terms with their illness.

Each individual has their own way of coping with difficult situations; some people find it helpful to talk to friends or family, while others prefer to seek help from people outside their situation. Some people prefer to keep their feelings to themselves. There is no right or wrong way to cope, but help is available if you need it.

Research - clinical trials for lung cancer

Cancer research trials are carried out to try to find new and better treatments for cancer. Trials carried out on patients are known as clinical trials.

Clinical trials may be carried out to:

- test new treatments, such as new chemotherapy drugs, gene therapy or cancer vaccines
- look at new combinations of existing treatments, or change the way they are given, in order to make them more effective or to reduce side effects
- compare the effectiveness of drugs used for symptom control
- find out how cancer treatments work
- see which treatments are the most cost-effective.

Trials are the only reliable way to find out if a different operation, type of chemotherapy, radiotherapy, or other treatment is better than what is already available.

Types of trials

There are different phases of research trial:

Phase 1 trials are used when a drug is first being given to people. Their cancer will have spread or come back and they will have had all the treatments available to them. Only a few people will be involved in a phase 1 trial and the aim is to see what effect the drug has, what the dose might be and whether it helps treat the cancer.

Phase 2 trials involve more people. They look at how many people the treatment helps and what types of cancer the treatment is effective for.

Phase 3 trials are large studies and look at a number of things such as whether a newer treatment may be better than the current standard treatment or whether it might have less side effects. Phase 3 trials always involve randomisation so a computer chooses which treatment you have. It may be a number of years before results are available.

Taking part in a trial

You may be asked to take part in a treatment research trial. There can be many benefits in doing this. Trials help to improve knowledge about cancer and the development of new treatments. You will also be carefully monitored during and after the study. Usually, several hospitals around the country take part in these trials.

It is important to bear in mind that some treatments that look promising at first are often later found not to be as good as existing treatments, or to have side effects that outweigh the benefits.

If you decide not to take part in a trial your decision will be respected and you do not have to give a reason. Hospital staff will not behave any differently towards you. You will be offered or continue with the standard treatment for your situation.

Blood and tumour samples

Many blood samples, and bone marrow or tumour biopsies, may be taken to find out what is wrong with you. You may be asked for your permission to use some of your samples for research into cancer. Some samples may be frozen and stored for future use, when new research techniques become available.

The research may be carried out at the hospital where you are treated, or it may be at another hospital. This type of research takes a long time, so you are unlikely to hear the results. The samples will, however, be used to increase knowledge about the causes of cancer and its treatment. This research will, hopefully, improve the outlook for future patients.

Current research

There are trials looking at giving chemotherapy either before or with radiotherapy. Chemotherapy given at the same time as radiotherapy is called concomitant chemotherapy. Other studies are looking at different doses of chemotherapy drugs and the use of chemotherapy with CHART (Continuous Hyperfractionated Accelerated Radiotherapy).

The process of clinical trials is described in more detail in our booklet on cancer research trials.

Resources and Support

JASCAP resources

Talking about your cancer

Practical advice and guidance for cancer patients to help them communicate with family, friends, carers and health professionals about emotional and practical issues arising from a diagnosis of cancer and cancer treatment.

Talking to children about cancer

Practical advice and guidance to help parents with cancer talk to their children about their cancer.

Talking to someone with cancer

Practical advice and guidance for friends, carers and family members to help them talk to their friend or relative with cancer, and provide emotional and practical support.

Note: JASCAP has booklets on each of the above subjects.

Questions you might like to ask your doctor or surgeon

You can fill this in before you see the doctor or surgeon, and then use it to remind yourself of the questions you want to ask, and the answers you receive.

1. _____

Answer _____

2. _____

Answer _____

3. _____

Answer _____

4. _____

Answer _____

5. _____

Answer _____

JASCAP : We need your help

We hope that you found this booklet useful.

To help other patients and their families we need and intend to extend our Patient Information Services in many ways.

Our Trust depends on voluntary donations. Please send your donation by Cheque or D/D payable in Mumbai in favour of "JASCAP".

Note for Reader

This JASCAP booklet is not designed to provide medical advice or professional services and is intended to be for educational use only. The information provided through JASCAP is not a substitute for professional care and should not be used for diagnosing or treating a health problem or a disease. If you have, or suspect you may have, a health problem you should consult your doctor.

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