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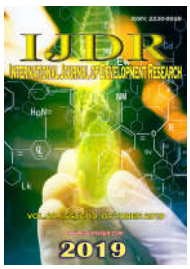

RESEARCH ARTICLE OPEN ACCESS

A REVIEW ON TREATMENT OF LUNG CANCER

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ABSTRACT

Lung cancer is one of the most common cancers in the world. The vast majority (85%) of cases are due to long term smoking. It is increasingly being recognized in India. Historically, the prognosis for individuals diagnosed with lung cancer has been bleak. However, the past 10 years have seen important advances in diagnosis and treatment which have translated into the first improvements seen in lung cancer survival. Lung cancer has long relied on testing for the molecular biomarkers. With increasing prevalence of smoking, lung cancer has reached epidemic proportions in India. It has surpassed the earlier commonest form of cancer, and now is the commonest malignancy in males in many hospitals. In addition to smoking, occupational exposure to carcinogens, indoor air pollution and dietary factors have recently been implicated in the causation of lung cancer. Molecular genetics of lung cancer has opened up new vistas of research in carcinogenesis. Chemotherapy applied as an adjunct with radiation improves survival and quality of life. New anticancer drugs which have emerged during the last decade have showed an improved efficacy – toxicity ratio. This review highlights the major advances in the treatments with surgery, radiation therapy, chemotherapy, targeted therapy, angiogenesis inhibitors and immunotherapy.

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INTRODUCTION

For several decades, lung cancer has been the most common cancer in the world. In 2014there were 46,403 new cases of lung cancer diagnosed in the UK. It is the third most common cancer after breast and prostate, but has the largest proportion of all cancer related deaths (22%). The overall age standardized incidence has declined slightly over the past 40 years, which is a combination of a marked decline among men and an increase for women. Approximately, 62% of people have stage disease at diagnosis. When combining all stages of lung cancer in England - one year survival has improved from 24.5% in 1995-9 to 36.7% currently. Much of this improvement has occurred since 2010 and is attributed to developments in lung cancer care.

Lung Cancer: Cancer is a disease in which cell in the body grow out of control.

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When cancer starts in the lungs it is called lung cancer. Lung cancer begins in the lungs and may spread to lymph nodes or other organs in the body, such as the brain. Cancer from other organs also may spread to the lungs, when cancer cells spread from one organ to another, they are called metastases.

Symptoms of lung cancer

Many people with lung cancer don't have symptoms until the disease is in its later stages. Because there are very few nerve endings in lungs, a tumor could grow without causing pain or discomfort. When symptoms are present, they are different in each person, but may include

- A cough that doesn't go away and gets worse over time
- Hoarseness
- Constant chest pain
- Shortness of breath or wheezing
- Frequent lung infections such as bronchitis or pneumonia
- Coughing up blood or phlegm

Some symptoms of lung cancer may not seem related to the lungs or breathing. These symptoms can still be a sign of lung cancer because lung cancer usually does not cause symptoms in its earlier stages. This means some symptoms do not appear until the cancer has spread to other parts of the body. Some of the symptoms may include Weight loss, Headache, Loss of appetite, Bone pain, and Blood clots.

As cancer spreads, additional symptoms depend on where new tumors form. For example

Lymph nodes : Lumps particularly in the neck or collarbone
Bones : Bone pain, particularly in the back, ribs, hips
Brain : Headache, dizziness, balance issues, numbness in arms and legs
Liver : Yellowing of skin and eyes (Jaundice)

Lung cancer sometimes creates a substance similar to hormones, causing a wide variety of symptoms, which include Muscle weakness, Nausea, Vomiting, Fluid retention, High blood pressure, High blood sugar, Confusion, Seizures, Coma.

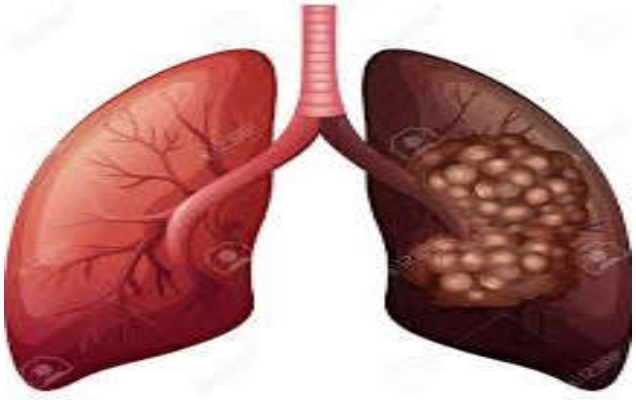

Figure 1. Difference between normal lung and cancer of lung

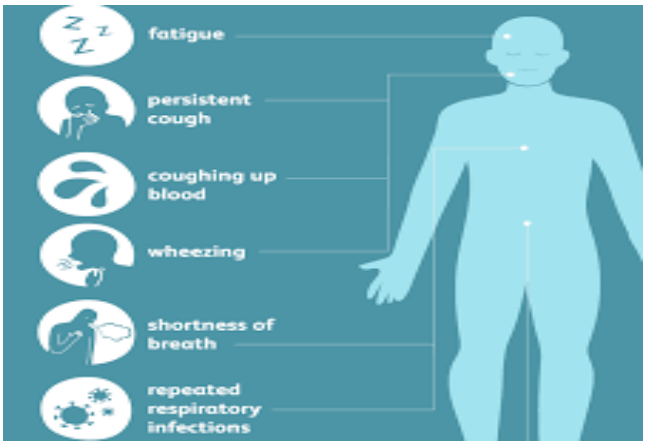

Figure 2. Symptoms of lung cancer

Causes of Lung Cancer: 90% of lung cancer cases are the result of smoking. From the moment you inhale smoke into your lungs, it starts damaging our lung tissue. The lungs can repair the damage the damage, but continued exposure to smoke makes it increasingly difficult to the lungs to keep up the repair. Exposure to radon, a naturally existing radioactive gas, is the second leading cause, according to the American lung association. Radon enters buildings through small cracks in the foundation. Smokers who are also exposed to radon have a very risk of lung cancer. Breathing in hazardous substances, especially over a long period of time, can also cause lung cancer. Other substances that can cause lung cancer are Arsenic, Cadmium, Chromium, Nickel, Uranium etc. Inherited genetic mutations may make you more likely to develop lung cancer, especially if you smoke or are exposed to other carcinogens.

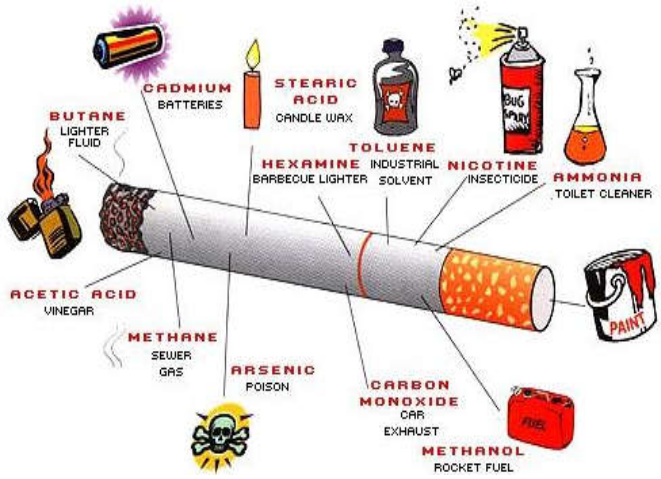

Figure 3. Causes of lung cancer

Types of lung cancer

Primary lung cancer: Cancer that starts in the lungs then it is called primary lung cancer. There are different types of primary lung cancer and they are divided into 2 main groups. They are

- Small cell lung cancer (SCLC)
- Non small cell lung cancer (NSCLC)

Small cell lung cancer: Small cell lung cancer represents about 15 to 20 %of lung cancers. SCLC grows and spreads faster than NSCLC. This also makes it more likely to respond to usually caused by smoking. Non small cell lung cancer: It is the most common type. NSCLC makes up about 80 to 85% of all cases. 30% of these cases start in the cells that form the lining of the body's cavities and surfaces. There are three common types. They are grouped together because they behave in a similar way and respond to treatment in a similar way.

The three types

Adenocarcinoma: This is the most common type and starts in the mucus making gland cells in the lining of airways.

Squamous cell carcinoma: This type develops in the flat cells that cover the surface of airways. It tends to grow near the centre of the lung.

Large cell carcinoma: The cancer cells appear large and round under the microscope.

Secondary lung cancer: If cancer spreads to our lungs from somewhere else in the body then it is called secondary lung cancer.

Stages of Lung Cancer: The chance of successful or curative treatment is much higher when lung cancer is diagnosed and treated in the early stages, before it spreads. Non small cell lung cancer has four main stages.

STAGE 1: Cancer is found in the lungs, but it has not spread outside the lung.

STAGE 2: Cancer is found in the lung and nearby lymph nodes.

STAGE 3: Cancer is in the lung and lymph nodes in the middle of the chest.

STAGE 3A: Cancer is found in the lymph nodes, but only on the same side of the chest where cancer first started growing.

STAGE 3B: Cancer has spread to lymph nodes on the opposite side of the chest or to the lymph nodes above the collarbone.

STAGE 4: Cancer has spread to both lungs, into the area around the lungs or to distant organs. Small cell lung cancer has two main stages

Limited Stage: In the limited stage, cancer is found in only one lung or nearby lymph nodes on the same side of the chest.

Extensive Stage: The extensive stage means cancer has spread, throughout one lung, to the opposite lung, to lymph nodes on the opposite side, to fluid around the lung, to bone marrow, to distant organs.

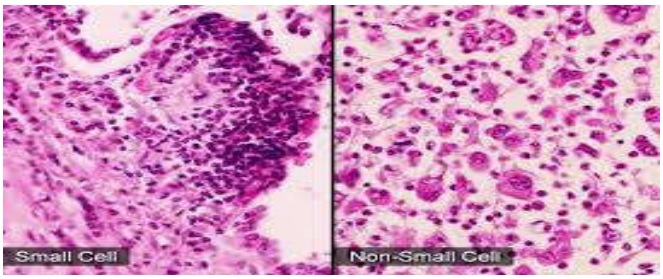

Figure 4. Difference of small cell lung cancer and non small cell lung cancer

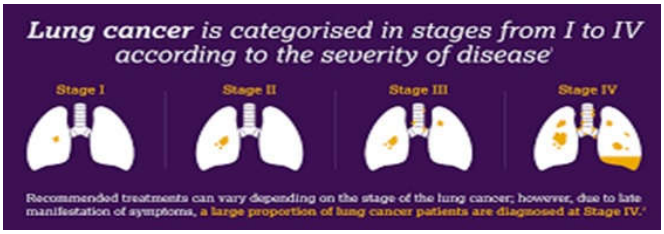

Figure 5. Stages of lung cancer

Risk factors for lung cancer: The biggest risk factor for lung cancer is smoking. That includes cigarettes, cigars and pipes. Tobacco products contain thousands of toxic substances. According to the centres for disease control and prevention, cigarette smokers are 15 to 30 times more likely to get lung cancer than non smokers. The longer you smoke, the greater the chance of developing lung cancer. Quitting smoking can lower that risk. Breathing in second hand smoke is also a major risk factor. Every year in the US, about 7300 people who have never smoked die from lung cancer caused by second hand smoke. Exposure to radon, a naturally occurring gas, increases the risk of lung cancer. Radon rises from the ground, entering buildings through small cracks. It is the leading cause of lung cancer in non smokers. The risk of developing lung cancer is higher if you are exposed to toxic substances such as asbestos or diesel exhaust in the work place.

Other risk factors include: Family history of lung cancer, Personal history of lung cancer, especially if you are a smoker, Previous radiation therapy to the chest, Radioactive ores such as uranium, Inhaled chemicals or minerals such as arsenic, beryllium, cadmium, silica, vinyl chloride, nickel compounds, chromium compounds, coal products, mustard gas.

Diagnosis for lung cancer

Imaging tests: An abnormal mass can be seen on x-ray, MRI, CT, and PET scans. These scans produce more detail and find smaller lesions.

Computed tomography scan: ACT scan is a special kind of x - ray that takes many pictures as you lie on a table that slides in and out of the machine. A computer then combines these pictures into a detailed picture of a slice of the body.

Positron emission tomography scan*:* For this scan, a form of radioactive sugar is injected into the blood. Cancer cells in the body absorb large amounts of the sugar. A special camera can then spot the radioactivity. This test can help show whether the cancer spread to the lymph nodes or other parts of the body.

Magnetic resonance imaging scan: An MRI also produces images that allow doctors to see the location of a lung tumor and/or lung cancer metastases and measure the tumor size. An MRI uses magnetic fields to produce detailed images of the body. For that reason, MRI is rarely used to look at the lungs.

Bone scan: A small, safe amount of radioactive substance is put into a vein. This substance builds up in the areas of bone that may not be normal because of cancer. These shows up as dense, grey to black areas, called “hot spots“. These areas may indicate cancer.

Sputum cytology: A sample of mucus you cough up from the lungs called sputum or phlegm is examined under a microscope to see if cancer cells are present.

Biopsy: The removal of small piece of tissue for laboratory examination is called biopsy. A biopsy can determine if tumor cells are cancerous. A tissue sample can be obtained by

- **Bronchoscopy:** A lighted, flexible tube called bronchoscope is passed through the mouth or nose and into the large air ways of the lungs. This test can help the doctor see tumors or it can be used to take samples of tissue or fluids to see if cancer cells are present.
- **Endo bronchial ultra sound:** For Endo bronchial ultra sound, a bronchoscope is fitted with an ultra sound device (a device that uses sound waves to make pictures of the inside of the body) at its tip. It is passed down into the wind pipe to look at nearby lymph nodes and other structures in the chest. This is done with numbing medicine (local anaesthesia) and light sedation. A hollow needle can be passed through the bronchoscope and guided by ultra sound into an area of concern to take biopsy samples.
- **Endoscopic oesophageal ultra sound:** This test is much like an endobronchial ultra sound, except that an endoscope is used. It is passed down the throat and into the oesophagus.
- **Fine needle biopsy:** A long, thin or fine needle is used to remove a sample of cells from the area that may be

cancer. The sample is examined in the lab to see if it contains cancer cells.

- **Mediastinoscopy and mediastinotomy:** Both of these tests let the surgeon look at and take samples of lymph nodes in the area between the lungs. This area is called mediastinum.
- Thoracentesis: This test is done to check whether fluid around the lungs is caused by cancer or by some other medical problem. A needle is placed between the ribs to drain the fluid. The fluid is checked for cancer cells.

Treatment options for lung cancer: Lung cancer treatments typically include one or more types of therapy such as surgery, chemotherapy, radiation therapy, targeted therapy, angiogenesis inhibitors and immunotherapy. Treatment options may also include palliative care, also called supportive care, to treat the symptoms and side effects of lung cancer itself and the lung cancer treatment such as pain or shortness of breath. The health care team may suggest hospice care to help manage pain and other symptoms.

Treatment Options for Non Small Cell Lung Cancer by Stage: The treatment for non small cell lung cancer depends in part on where the lung cancer is located within the lungs and whether the cancer has spread or not.

Stages 1A and 1B: Surgery alone or followed by Radiation therapy. Chemotherapy, if high risk for recurrence. New treatments available through clinical trials. Treatment given through an endoscope such as photodynamic therapy. Chemotherapy or radiation therapy following surgery.

Stage 2A: Surgery, followed by chemotherapy with or without radiation therapy, Surgery followed by radiation therapy, Chemotherapy followed by surgery, Radiation therapy for patients who cannot or choose not to have surgery,

Stage 2B: Surgery, followed by chemotherapy with or without radiation therapy, Surgery followed by radiation therapy, Radiation therapy for patients who cannot or choose not to have surgery, New treatments available through clinical trials. Non small cell lung cancer of the superior sulcus, often called as pan coast tumor, begins in the upper part of the lung and spreads to nearby tissues such as the ribs and vertebrae.

Stage 3A

- If the patient has lung cancer, the following may be treatment options are
- Surgery followed by adjuvant chemotherapy and post operative radiation therapy.
- Neoadjuvant chemotherapy followed by surgery and post operative radiation therapy.
- New treatments available through clinical trials, including new types or combinations of treatments. If the patient has lung cancer that cannot be remove d by surgery, options include
- Chemotherapy and radiation therapy given as separate treatments over a period of time.
- Immunotherapy after chemotherapy and radiation therapy is complete.
- New treatments available through clinical trials, including new types or combinations of treatments.

Non small cell lung cancer of the superior sulcus, often called as pan coast tumor, begins in the upper part of the lung and spreads to nearby tissues such as the ribs and vertebrae. Treatment of pan coast tumors may include the following

- Radiation therapy alone.
- Radiation therapy followed by surgery.
- Chemotherapy and radiation therapy given as separate treatment over the same period of time, followed by surgery.
- A clinical trial of new combinations of treatment.

Stage 3B and 3C

- External beam radiation therapy.
- Chemotherapy and external beam radiation therapy given one after the other or combined at the same time.
- Targeted therapy with a tyrosine kinase inhibitor if a driven mutation is present.
- Internal radiation therapy as palliative care.
- Immunotherapy after chemotherapy and radiation therapy is complete.
- New treatments available through clinical trials, including new types or combinations of treatments.

Stage 4A and 4B

- Combination chemotherapy and targeted therapy with a monoclonal antibody.
- Targeted therapy with a tyrosine kinase inhibitor if a driven mutation is present.
- Internal radiation therapy for cancer that has not spread to major lymph nodes.
- Immunotherapy drugs.
- Combination immunotherapy and chemotherapy and angiogenesis inhibitor.
- Clinical trials of chemotherapy drugs, targeted therapy drugs, immunotherapy drugs, or a combination of these.
- Treatments specific for bone and brain metastasis, such as bisphosphates (for bone metastasis)or brain radiation or surgery (for brain metastasis).
- External or internal radiation therapy as palliative therapy, to relieve pain and other symptoms and improve the quality of life.

Treatment Options for small Cell Lung Cancer: Small cell lung cancer is most recently being classified into stages in the same way that non small cell lung cancer is. However, national cancer institute treatment guidelines still organize treatment options by whether the small cell cancer is limited to the lung or has spread more extensively.

Limited Stage Disease

- Combination chemotherapy.
- Combination chemotherapy and external radiation therapy.
- Surgery, followed by chemotherapy or chemo radiotherapy.
- Radiation therapy to the brain for patients who have had a complete response, to prevent the spread of cancer to the brain also known as prophylactic cranial irradiation.

- Clinical trials of new chemotherapy, surgery and radiation treatments.

Extensive Stage Disease

- Combination chemotherapy.
- Radiation to the brain, spine, bone or other parts of the body where the cancer has spread, as palliative therapy to relieve symptoms and improve the quality of life.
- Radiation therapy to the brain for patients who have had a complete response, to prevent the spread of cancer to the brain also known as prophylactic cranial irradiation.
- Immunotherapy - atezolizumab in combination with carboplatin and etoposide for the first line treatment of adult patients.
- Immunotherapy – nivolumab for patients who have progressed after platinum based chemotherapy and at least one other line of therapy.
- Immunotherapy – pembrolizumab for patients who have progressed on or after platinum based chemotherapy and at least one other prior line of therapy.
- Clinical trials of new treatment options.

Surgery: Surgery – the removal of tumor and some healthy tissue around the tumor during an operation – is a treatment option in lung cancer only when the patient is healthy enough for surgery, and the tumor:

- Has been found early
- Is able to be completely removed safely and
- Has not spread within the chest or to other organs

When surgery is an option in a patient with non small cell lung cancer, it is the main treatment because it provides the best chance for a cure. Surgery can be used for non small cell lung cancer patients with stage 1, stage 2 and some stage 3A lung cancers. It is not used for stage 4 non small cell lung cancer, which is Surgery is rarely used as the main treatment in small cell lung cancer because most patients are diagnosed after the cancer has spread to other parts of the body. Lung cancer surgery may be used in combination with chemotherapy and / or radiation therapy. Chemotherapy may be given either before surgery (neoadjuvant) or after surgery (adjuvant) for all non small cell lung cancer patients who undergo surgery, in order to eliminate any small amount of cancer that was not detected and removed by surgery. Lung cancer surgery is a complex operation that can have serious consequences. Therefore, it should be performed by a thoracic surgeon – a surgeon specially trained in operating on people with lung cancer. Goal of surgery in the treatment of lung cancer The goal of lung cancer is to completely remove lung tumor. The tumor is removed along with a border, known as a margin, of healthy tissue surrounding the tumor. The tumor is said to have clear margins if the pathologist who examines the tumor tissue after the surgery finds no cancer in the margin. During surgery, nearby lymph nodes in the lung and middle portion of the chest are also removed to check them for cancer and help to determine whether further treatment is necessary.

Different Types of Surgery used in Lung Cancer

Thoracoscopy: A thoracoscopy is a minimally invasive surgery that uses small incisions and small instruments to examine and perform operations in the inside of the chest. It is also known as video assisted thoracic surgery. This procedure requires a great deal of technical skill and should only be performed by a surgeon who has specific training and experiences in it. VATS to remove lung cancer is done in an operating room under general anaesthesia. During the operation, a thin tube with a light and a tiny video camera around freely inside the chest, watching the image on the TV – screen. One or two other small incisions are used for long instruments that are used to do the same operation that would be done using a thoracotomy.

Robotic assisted surgery: A newer type of minimally invasive operation known as robotic assisted surgery is being performed at some large cancer centres in the US. In this approach, a surgeon sits at a control panel, inside the operating room, using robotic arms as surgical instruments. Robotic surgery requires special training and expertise. Common side effects and management techniques for lung cancer surgery include: Pain, Fatigue, Fluid, blood or air in the chest, Shortness of breath, Loss of muscle.

Radiation therapy: Radiation therapy is also known as radio therapy. It is a type of cancer treatment that uses high powered energy beams – x rays most commonly but other types of energy as well – to kill cancer cells and shrink tumors in its path while doing the least damage to the surrounding health tissue. Radiation therapy is used in a number of ways. It is used depends on a patient's type and stage of lung cancer and medical and other factors like as a patient primary treatment, before surgery to help reduce the size of tumor to make it easier to remove, after surgery to kill any remaining cancer cells, as a treatment for lung cancer that has spread to another area of the body such as brain, to relieve symptoms in advanced lung cancer, such as pain or shortness of breath, by shrinking the tumor. Radiation therapy may potentially be used at all stages of both non small cell lung cancer and small cell lung cancer.Radiation therapy works by damaging the cancer ability to grow and multiply; it attacks the DNA within the cells that control these functions. When the cancer cells die, the body naturally eliminates them. Unlike systemic chemotherapy, which kills cancer cells wherever they are throughout the body, radiation only kills the cancer cells directly in the path of the radiation beam. Radiation therapy damages cancer cells, which divide rapidly, more than normal, healthy cells, but it does damage the normal, healthy cells in its path as well. Fortunately, these normal, healthy cells are often able to repair a large part of the damage caused by the radiation therapy. The goal in radiation therapy is to give doses of radiation that are large enough to kill as many of the cancer cells as possible but at the same time do as little damage to the normal, healthy cells in the area where the radiation is given. Radiation therapy does not work immediately, and it varies in its effectiveness by patient. It takes days or weeks before the damage to the DNA is enough for the cells to die. After radiation therapy ends, the cancer cells continue to die for up to months after.

Radiation oncologist: The radiation oncologist has overall responsibility for a patient radiation therapy treatment. It is the radiation oncologist who determines, based on consultation with the patient's other doctor's and other medical information, whether a patient may be a candidate for radiation therapy and what treatment might be the best. The radiation oncologist develops and prescribes the radiation therapy plan,

makes sure that the treatment is given accurately, monitors the patient's progress, and adjusts the plan as necessary to make sure it is the most effective plan possible. The radiation oncologist meets regularly with patients. Radiation therapist: The radiation therapist delivers the radiation treatments, Keeps records, and makes sure that the machine delivering the radiation is working properly. The radiation therapist also lets the radiation oncologist know if the patient is experiencing any problems with the treatment.

Medical physicist: The medical physicist is responsible for the quality control of the radiation equipment and the radiation treatment procedures. The medical physicist ensures that the equipment is working as it should by conducting safety tests regularly, including measuring the radiation beam itself. The medical physicist works closely with the dosimetrist**.**

Dosimetrist: Although it is the radiation oncology who prescribes the radiation dose for a patient, it is the dosimetrist's job to make the very complex and technical calculations that determine a patient's personalized radiation treatment plan.

Radiation oncologist nurse*:* The radiation oncology nurse cares for a patient during the entire course of the radiation treatment: before, during, and after. The radiation oncology nurse is there to answer any questions, monitor a patient's health, and help manage any side effects.

Radiation therapy administration: Radiation can come from a machine outside the body (external beam radiation therapy) or from radioactive material placed inside the body (internal radiation therapy). Before any radiation treatment is decided on, the radiation oncologist may do a physical exam, take a medical history, and consider other factors.

External beam radiation therapy (EBRT): When radiation therapy is directed at the lung cancer from outside the body, it is called external beam radiation therapy. This is the type of radiation therapy most often used to treat both non small cell lung cancer and small cell lung cancer. The radiation machine used most often is a linear accelerator.

Types of EBRT: The radiation oncologist determines which EBRT technique may be best for a patient. These techniques include

- Three dimensional conformal radiation therapy (3D CRT)
- Four dimensional conformal radiation therapy (4D CRT)
- Intensity modulated radiation therapy (IMRT)
- Image guided radiation therapy (IGRT)
- Stereotactic body radiation therapy (SBRT)
- Proton therapy

Internal Radiation Therapy: Radiation sources can be placed inside the body in solids or in liquids. More often, they are placed in the form of solids. This type of internal radiation therapy is brachytherapy. During treatment, a small source of radioactive material, often in the form of small pellets or seeds, is inserted directly into the cancer or into the Airway next to the cancer. This is usually done during bronchoscopy or during surgery.

Administration of Radiation Therapy in non small cell Lung Cancer: The type of radiation therapy most often used to treat non small cell lung cancer is external beam radiation therapy. In patients with early stage non small cell lung cancer, in which there is only a single small nodule in the lung without any spread nearby lymph nodes. Stereotactic body radiation therapy is typically given. SBRT is recommended for patients who cannot be treated surgically.

Administration of radiation therapy in small cell lung cancer: The type of radiation most often used to treat small cell lung cancer is external beam radiation therapy. Most often, radiation therapy administered as the initial treatment for Small cell lung cancer is given once or twice daily, 5 days a week, for 3 to 7 days. EBRT is most often given at the same as chemotherapy in limited stage disease to treat the tumor and lymph nodes in the chest. Sometimes it is given after chemotherapy, as adjuvant therapy, to try to kill any small areas of cancer that may remain. In extensive stage small cell lung cancer, EBRT may be used to shrink tumors to relieve symptoms of lung cancer such as bleeding, trouble swallowing, cough and shortness of breath.

Side effects of radiation therapy: Fatigue, sun burn like skin changes such as dryness, itching, peeling, hair loss, cough, difficulty in breathing and shortness of breath, sore throat and trouble swallowing, nausea and vomiting.

Chemotherapy: Chemotherapy is a treatment that uses drugs to stop the growth and division of tumor cells. While each patient responds differently to chemotherapy drugs, chemotherapy treatment can shrink lung cancer tumors, alleviate lung cancer symptoms, and extend life. Chemotherapy can be used at all stages of lung cancer and for both non small cell lung cancer and small cell lung cancer. Chemotherapy can be used as a cancer treatment for many years and remains important despite the addition in recent years of newer types of drug treatment - targeted therapies, angiogenesis inhibitors and immunotherapy – that attack cancer in a different way. Chemotherapy may be used as a single drug or in combination with other chemotherapy drugs, in combination with some of the newer treatments, and with surgery and radiation therapy to make them more effective.

Administration of chemotherapy: Chemotherapy can administered systemically in many ways, including orally, intravenously, subcutaneously, and intramuscularly. To treat lung cancer, chemotherapy drugs are usually given intravenously through a needle or tube inserted into a vein. Sometimes a chemo port may be placed under the skin. The chemo port may stay for a week to months and helps in the administration of the drug while avoiding multiple needle pricks. Chemotherapy may be given one drug at a time or as a combination of different drugs at the same time. Usually chemotherapy is given in cycles. A typical cycle consists of a period of treatment of 1 to 3 days followed by a break before the next treatment is given so that a patient can rest and allow the body time to recover. A chemotherapy cycle can generally lasts 3 to 4 weeks and continues over a period of months. Sometimes chemotherapies are planned for a specific number of cycles, typically 4 to 6 cycles.

Preparing for Chemotherapy Treatment: There are a number of things you can do to help prepare for chemotherapy treatment. They may include: Having a surgical procedure to

insert a device, such as a chemo port, into a vein if your chemotherapy will be administered intravenously. The advantage of this is that a vein will not need to be found at each chemotherapy session. Planning ahead for possible side effects.

Goals of Chemotherapy: The goals of lung cancer chemotherapy depend on the type of lung cancer being treated, the stage of lung cancer. Some possible chemotherapy goals are to eliminate all of the cancer cells and to prevent recurrence after surgery or some other type of treatment, To decrease the size of tumors for easier and safer removal by surgery, To control the lung cancer by stopping it from growing and spreading, To help make other cancer killing treatments such as radiation therapy, more effective, To relieve symptoms caused by the cancer and to slow its growth when the cancer is at an advanced stage.

Side effects of chemotherapy: Constipation, Diarrhoea, Bruising or bleeding, Fatigue, Hair loss, Increased risk of infection, Loss of appetite, Mouth and throat sores, Nausea, Vomiting, Peripheral neurotherapy.

Chemotherapy drugs for non small cell lung cancer include: Carboplatin, Cisplatin, Docetaxel, Etoposide, Gemcitabine, Paclitaxel, Pemetrexed, and Vinorelbine.

Chemotherapy drugs for small cell lung cancer include: Carboplatin, Cisplatin, Docetaxel, Etoposide, Gemcitabine, and Pemetrexd.

Targeted therapy: Targeted therapy is a type of treatment that uses drugs to attack cancer cells, including some kinds of lung cancer cells. These drugs target specific parts of the cells and the signals that proteins send to cells that cause them to grow and divide uncontrollably. Targeted therapies are a type of treatment that targets specific molecules that are essential for cancer cells to grow and divide uncontrollably. They differ from standard chemotherapy in that they block the cancer cells growth and division rather than, as chemotherapy does, kill the cancer cells directly. Targeted therapies are more precise than chemotherapy drugs and do not affect healthy cells, which chemotherapy drugs do, so a patient is likely to experience fewer side effects with them.

Angiogenesis inhibitors: The process by which the body makes new blood vessels is called angiogenesis. However, when new blood vessels transport oxygen and nutrients to the cancer cells of a tumor, they help the tumor to grow and spread. The goal of drugs known as angiogenesis inhibitors is to help stop or slow the growth or spread of tumors by stopping the formation of blood vessels that go to them. Angiogenesis inhibitors stop the formation of new blood vessels in order to cut off tumors blood supply. They may also make the tumors vasculature more normal so that chemotherapy drugs can get to the tumor more effectively. Currently two angiogenesis inhibitors are approved by the US food and drug administration for the treatment of non small cell lung cancer. They are Bevacizumab and Ramucirumab. Bevacizumab is given intravenously every 3 weeks. Ramucirumab is given intravenously once every 3 weeks over approximately 60 minutes. It is given before docetaxel infusion. Angiogenesis inhibitors can cause side effects. Common side effects of Bevacizumab include nosebleeds headache, high blood pressure, and inflammation of the nose, taste alteration, dry skin, rectal hemorrhage, increased tearing of the eyes, back pain, redness and peeling of the skin. Ramucirumab side effects seen in patients treated with the combination of ramucirumab and docetaxel include neutropenia, fatigue, weakness, stomatitis and irritation or inflammation of other mucous membranes.

Immunotherapy: Immunotherapy for lung cancer is a type of treatment that aims to enhance the body's immune response and stop the lung cancer from evading the immune system. The Immune system is a complex network of cells, tissues and organs that work together to protect the body from foreign invaders such as bacteria or viruses. The key players in defending the body are a specific type of white blood cells called lymphocytes. There are three types of lymphocytes: B cells, T cells, and natural killer cells. Lymphocytes grow and develop in the bone marrow, thymus, and spleen. They can also found in clumps throughout the body, primarily as lymph nodes. The lymphocytes circulate through the body between the organs and nodes via lymphatic vessels and blood vessels. The immune system has two responses that work together to detect and destroy cancer cells called innate immune response and adaptive immune response. The innate immune response is the first line of defence. The innate immune system's normal function is to protect the body from initial invasion by bacteria and viruses, such as when bacteria invade broken skin or viruses land in the throat. The system includes natural killer cells, a type of lymphocyte that patrols the body and is on constant cells. If cells from the innate immune system recognize a cancer cell as abnormal, they can attach to it and immediately release toxic chemicals that kill it. NK cells and other cells of the innate immune system do not need to recognize a specific abnormality on a cell to be able to their job. If the bacteria, viruses, or cancer cells evade the innate response, then the adaptive immune response becomes active. The adaptive immune response recognizes specific abnormalities on cancer cells that make them different from the cells that are naturally found in the body. Though it is more effective then the innate immune response, the adaptive immune response takes longer to become activated. The cells of the adaptive immune response include the other two types of lymphocytes: B cells and T cells. Immunotherapy is considered a type of biological therapy. It aims to enhance the body's immune response and stop lung cancers from escaping from the immune system. Immunotherapy is a treatment that strengthens the natural ability of the patient's immune system to fight cancer. Instead of targeting the person's cancer cells directly. Immunotherapy trains a person's natural immune system to immune system or by enabling the immune system to mount or maintain a response. The immune checkpoint inhibitors work by targeting and blocking the fail- safe mechanisms of the immune system. Their goal is to block immune system from limiting itself, so that the original anti cancer response works better.

Conclusion

Many pharmacological, technical and service developments have been made in the treatment of lung cancer over the past 10 years. Although new treatments are available there are inequalities in access to them and further consideration in commissioning of resources is needed to tackle the hub and spoke effect. The high rates of responses to the biology of lung cancers with certain oncogenic drivers offer unique opportunities to explore potentially beneficial treatments. Further study and concept data are needed to determine

whether treatment of early stage lung cancer with effective targeted therapies can eradicate microscopic disease and improve cure rates.

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