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VARIOUS MODES OF ALLOPATHIC & AYURVEDIC PREPARATION AND TREATMENT MODE OF LUNGS CANCER IN INDIA

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ABSTRACT

Lung cancer begins in the lungs and may spread to lymph nodes or other organs in the body, such as the brain. In humans each lung is encased in a thin membranous sac called the pleura, and is connected with the trachea (windpipe) by its main bronchus (large air passageway) and with the heart by the pulmonary arteries. Various stages are used for Small Cell lung cancer are- Limited Stage Small Cell Lung Cancer, Small Cell Lung Cancer can recur, Extensive Stage Small Cell Lung Cancer. Allopathic medicines used in the treatment of Small Cell Lung Cancer are- Atezolizumab, Doxorubicin hydrochloride, Durvalumab, Lurbinectedin. Herbal medicines used in the treatment are- Tulsi, Curcumin, Ashwagandha, Achilles. Stage & treatment of Non Small Cell Lung Cancer are- Occult (hidden) stage, Stage I, Stage II, Stage III, Stage IV & Surgery, Adjuvant chemotherapy, Radiation therapy Immunotherapy. Finally patient will go for chemotherapy. As lung cancer patient have to drink Amla + Aloe Vera Juice before breakfast & 30 Minute patients has to consume before Sleep 1 glass milk + 1 tsp of Turmeric + Ashwagandha Churna + Shatavri Churna/Haridrakhand powder. Do yoga & pranayam (Bhastrika, Bahyapranayaam, and Ujjaayi) regularly. Preventive measures to taken during Lung Cancer will be avoid smoking, cold water and food, environmental risk factors.

KEYWORDS: Lung cancer, Pleura, Small-cell lung cancer, Occult stage, Adjuvant chemo-therapy, Radiation therapy, Yoga & Pranayam.

INTRODUCTION

Cancer[1,2]

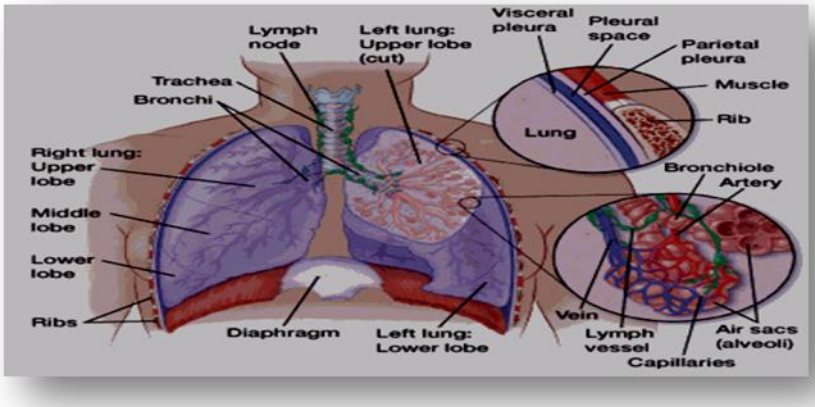
Cancer is made up of abnormal cells that grow even though our body. In most of the cancers, the abnormal cells grow to form a lump or mass called a tumor. All across the world, people

are facing a wealth of new and challenging environmental problems every day. Pollution of air, water and soil require millions of years to recoup. The global burden of cancer continues to increase largely because of the aging and growth of the world population and an increasing adoption of cancer causing behaviors, particularly smoking, within economically developing countries. Female breast, lung, and colon- rectal cancers are occurring in high frequencies in many economically developing countries, in addition to the disproportionately high burden of cancers related to infections. This is the second most common disease after cardiovascular disorders for maximum deaths in the world. It accounts for about 23 and 7% deaths in USA and India, respectively.

Lungs cancer[3,4]

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.

Anatomy lung - Lungs in air-breathing vertebrates, either of the two large organs of respiration located in the chest cavity and responsible for adding oxygen to and removing carbon dioxide from the blood. In humans each lung is encased in a thin membranous sac called the pleura, and each is connected with the trachea (windpipe) by its main bronchus (large air passageway) and with the heart by the pulmonary arteries. The lungs are soft, light, spongy, elastic organs that normally, after birth, always contain some air.



Lung cancer can affect anyone, but there are certain factors that raise our risk of getting it- Smoking**,** family history of lung cancer**,** radiation therapy**,** HIV infection**,** air pollution

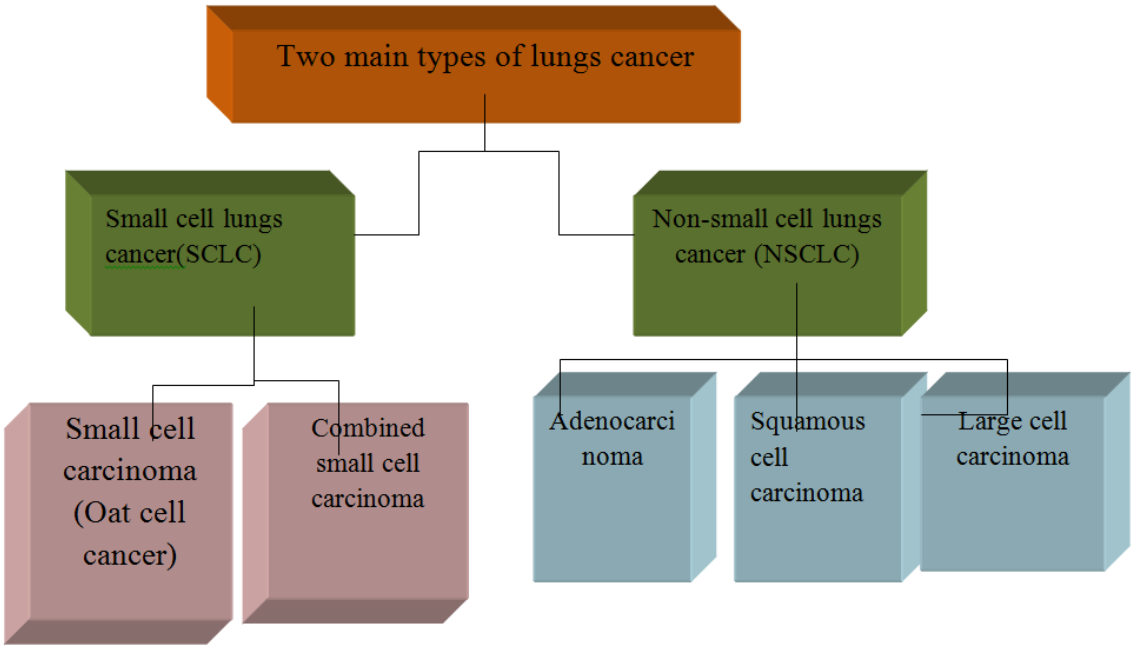
Lung cancer typically doesn't present with symptoms in early stages. The symptoms typically manifest in advanced stage such as[5]

Persistent cough, blood in sputum, shortness of breath, chest pain, hoarseness of voice, unexplained weight loss, bone pain, headache.

Diagnosis

Laboratory, CT scan, bronchoscope, chest x-ray, laboratory tests etc.

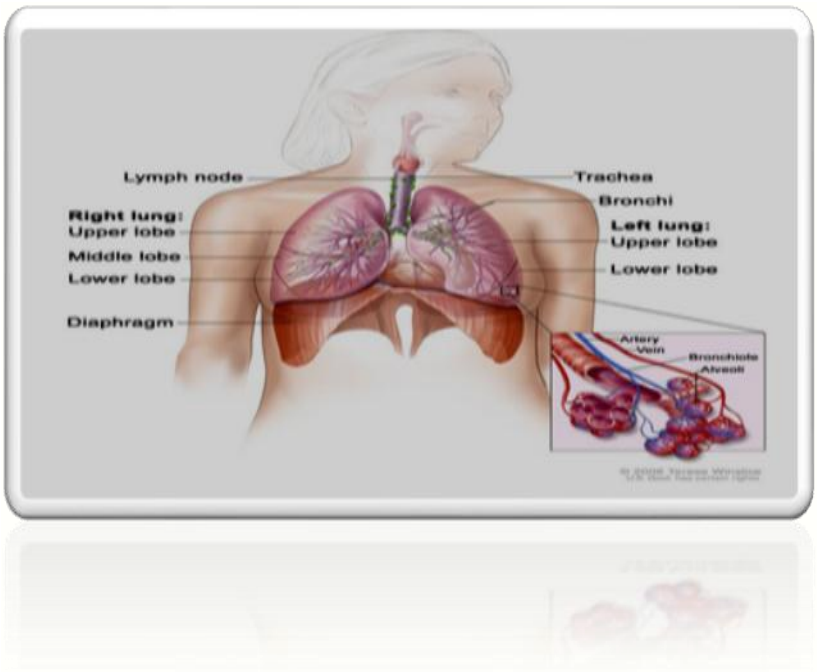
Classification of lungs cancer[6]



Small Cell Lungs Cancer[7] (SCLC)

The lungs are a pair of cone-shaped breathing organs that are found in the chest. The lungs bring oxygen into the body when patient breathe in and take out carbon dioxide when patient breathe out. Each lung has sections called lobes. The left lung has two lobes. The right lung, which is slightly larger, has three. A thin membrane called the pleura surrounds the lungs. Two tubes called bronchi lead from the trachea (windpipe) to the right and left lungs.

The bronchi are sometimes also affected by lung cancer.[4] Small tubes called bronchioles and tiny air sacs called alveoli make up the inside of the lungs.



These two types include many different types of cells. The cancer cells of each type grow and spread in different ways. The types of small cell lung cancer are named for the kinds of cells found in the cancer and how the cells look when viewed under a microscope.

The following stages are used for Small Cell Lung Cancer[8,9]

Limited-Stage Small Cell Lung Cancer - In limited-stage, cancer is in the lung where it started and may have spread to the area between the lungs or to the lymph nodes above the collarbone.

Small Cell Lung Cancer can recur (come back) after it has been treated - The cancer may come back in the chest, central nervous system, or in other parts of the body.

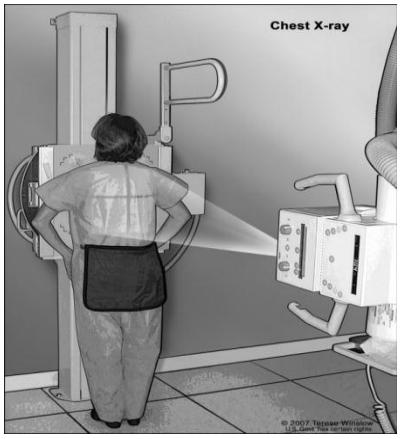
Extensive-Stage Small Cell Lung Cancer - In extensive-stage, cancer has spread beyond the lung or the area between the lungs or the lymph nodes above the collarbone to other places in the body.

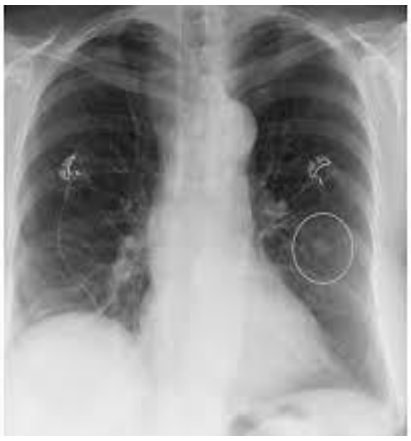
Smoking is the major risk factor for Small Cell Lung Cancer

Anything that increases our chance of getting a disease is called a risk factor. The risk factor that does not mean that patient will get cancer; not having risk factors doesn't mean that patient will not get cancer. Smoking cigarettes, pipes, or cigars, now or in the past. This is the most important risk factor for lung cancer. The earlier in life a person starts smoking, Starts continuing, smoking for longer period of time, the greater the risk of lung cancer arises.

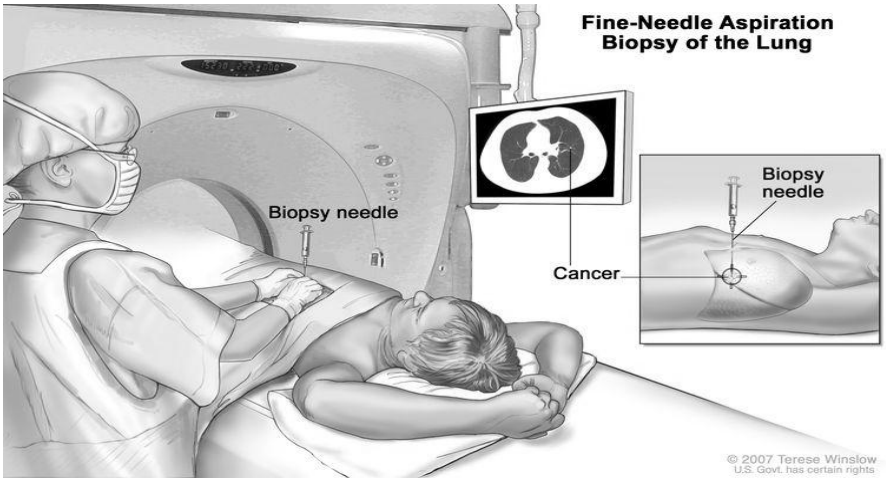
Tests and procedures that examine the lungs are used to diagnose and stage small cell lung cancer[10 to 13]

- **Physical exam** and **health history**- An exam of the body to check general signs of health, including checking for signs of disease, such as **lumps** or anything else that seems unusual.
- **Laboratory tests**- Medical procedures that test samples of tissue, blood, urine, or other substances in the body. These tests help to diagnose disease, plan and check treatment, or monitor the disease over time.
- **Chest x-ray**- An x-ray of the organs and bones inside the chest.

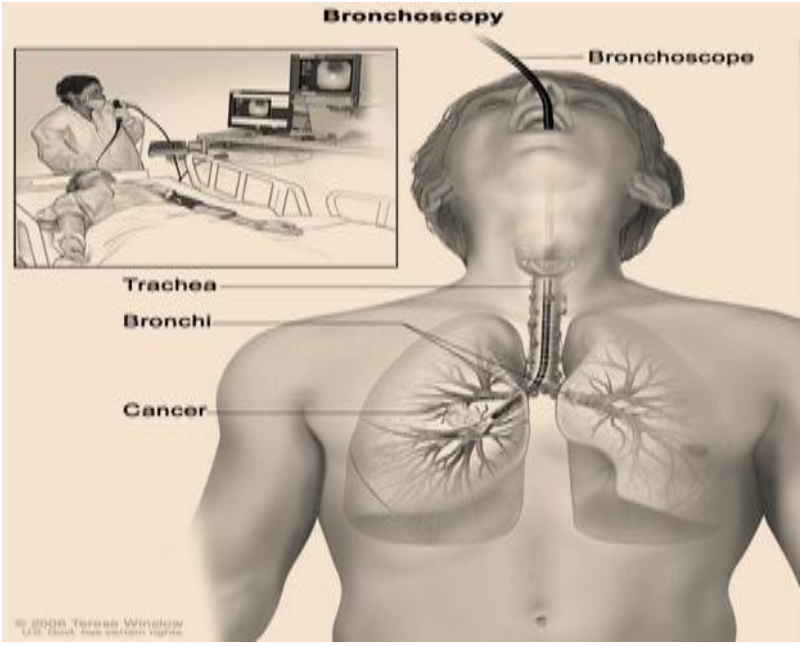




- **Thoracoscopy** - A surgical procedure to look at the organs inside the chest to check for abnormal areas. An incision (cut) is made between two ribs, and a thoracoscope is inserted into the chest.
- **Thoracentesis**- The removal of fluid from the space between the lining of the chest and the lung, using a needle. A pathologist/doctor views the fluid under a microscope to look for cancer cells.
- **Light and electron microscopy**- A laboratory test in which cells in a sample of tissue are viewed under regular and high-powered microscopes to look for certain changes in the cells.
- **CT scan**- A procedure that makes a series of detailed pictures of areas inside the body, taken from different angles. This procedure is also called computed tomography, computerized tomography, or computerized axial tomography.



- **Bronchoscopy-** A procedure to look inside the trachea and large airways in the lung for abnormal areas. A bronchoscope is inserted through the nose or mouth into the trachea and lungs.



- **Mediastinoscopy**- A surgical procedure to look at the organs, tissues, and lymph nodes between the lungs for abnormal areas. An incision (cut) is made at the top of the breastbone and a mediastinoscope is inserted into the chest.
- **Immuno histochemistry**- A laboratory test that uses antibodies to check for certain antigens (markers) in a sample of a patient's tissue. The antibodies are usually linked to an enzyme or a fluorescent dye.

Therapies for Small Lungs Cancer[14 to 18]

Sr. No.	Therapy	Drugs	Dose	Duration	Mode of actions	Side effect	Result
1.	Chemotherapy	Anthracycylines, Daunorubin, Doxorubixin	60 to 75 mg/m, 270 mg/m^2,	3 or 4 weeks long, 4 to 6 cycles.	Interfere of DNA replication in all phase cell cycle	Hair loss, Nausea, Vomiting, Diarrhea, Constipation.	Have a good response to chemotherapy
2.	Immunotherapy	Atezolizumab, Durvalumab, Nivolumab.	840 mg, 1500 mg, 3 mg.	2 to 3 weeks, Treatment take about 30-90 minutes.	Binds to PD-L1 to stop the interaction between PD-1 and B7.	Skin reactions, Flu-like symptoms, Diarrhea, Weight changes.	Shown to have positive effects treatment of SCLC patients.
3.	Radiation Therapy.	X-rays,Gamma rays, Electron beams.	Wavelength 2100 nm	3 to 7 weeks	-	Skin irritation, Fever, Hair loss, Inflames the lung.	High-energy X-rays to kill cancer cells, Shown to have positive effects.
4.	Palliative Procedures	Acetaminophen, haloperidol, lorazepam, morphine.	12.5 mg/kg, 100 mg, 10 mg/day, 100 mg.	Median of 18–57 days and Mean of 30–70 days.	Activation of descending serotonergic pathways, increasing the levels of a calming chemical.	Pain, shortness of breath, fatigue, constipation, nausea.	Providing relief from the symptoms and stress of the illness.

Common side effect of Radiation Therapy for Small Cell Lung Cancer[19]

Headaches, hair loss, Nausea, Vomiting, extreme tiredness (fatigue), hearing loss, skin and scalp changes, trouble with memory and speech.

Prevention of small cell lungs cancer- The most important way to prevent SCLC is to avoid tobacco smoke. People who never smoke have the lowest risk of SCLC. People who smoke can reduce their risk of SCLC by **stopping smoking**, but their risk of SCLC will still be higher than people who never smoked.

Allopathic medicines treating small cell lungs cancer[20 to 24]

Sr. No.	Drug name	Brand Name	Category of drug	Dose	Mode of action	Uses	Remarks	Side effect
1.	Atezolizumab	Tecentria	Monoclonal antibodies	840 mg IV	Inhibitor the selectively binds to PD-L1 to stop the interaction between PD-1 and B7	Breast, skin, lung, liver	Bladder,urinary tract, Hepatocellular carcinoma	• Black, tarry stools. • bladder pain, body aches or pain, • chest tightness.
2.	Doxorubicim hydrochloride	Adriamycin PFS, Adriamycin RDF, Rubex.	anthracyclines	300 mg/m^2	DNA by intercalation and inhibition of macromolecular biosynthesis	Bladder, breast, lung, stomach	Ovarian cancer; Hodgkin's lymphoma and non-Hodgkin's lymphoma	Cough or hoarseness, fast or irregular heartbeat. • Fever, • Joint pain.
3.	Durvalumab	Imfinzi	Monoclonal-antibodies	1500 mg IV	Blocks the interaction of PD-L1 with PD-1 and CD80 (B7. 1) to release the inhibition of immune responses	Lungs cancer, bladder, or urinary tract	NSCLC,SCLC,stimated 49.6%	• Bladder pain, swelling face, arms, hands, lower legs, feet. • Bloody, cloudy urine.
4.	Etoposied phosphate	Etopophose	Topoisomerase II inhibitor	35 mg/m^2	DNA strand breaks by an interaction with DNAtopoisomerase II	Testicular, bladder, prostate, uterine, cancers, neuroblastoma.	Mycosis fungoides, Kaposi's sarcoma, Wilm's tumor.	• Nausea, vomiting, • diarrhea, • constipation, • stomach pain, • muscle aches.
5.	Topotecan hydrochloride	Hycamtin	Antineoplastics, topoisomerase Inhibitors	1.5 mg/m^2	Topotecan binds to the topoisomerase I-DNA complex and prevents	Cervical cancer.	Cisplatin, Ovarian cancer.	Nausea, vomiting, constipation, diarrhea, abdominal pain, weakness,

					religation			tiredness.
6.	Lurbinectedin	Zepzelca	Alkylating agents	3.2 mg/m^2	Leads to double-strand DNA breaks,inhibits RNA-polymerase-II	Platinum chemotherapy	Small cell lungs cancer(SCLC)	• Black, tarry stools, bloody urine, • bone, joint pain, chest pain.
7.	Everolimus	Afinitor, Afinitor disperz, Zortress	Kinase inhibitors	2.5mg, 5mg,7.5mg,10mg	Blocks growth-driven transduction signals in the T-cell response to alloantigen	RCC, cancer that begins in the kidneys	Blocks cancer growth pancreatic cancer.	• Bloating, swelling of the face, arms, hands, lower legs, feet, chest pain.
8.	Methotrexate sodium	Trexall, Xatmep	Antimetabolites	2.5mg	Methotrexate competitively inhibits dihydrofolate reductase (DHFR)	Treat certain types of cancer	Rheumatoid arthritis (RA).	Nausea, vomiting, stomach pain, drowsiness, or dizziness.

Herbal medicines treating small cell lungs cancer[25 to 29]

Sr. No.	Plant name [Biological source]	Family	Parts of plant	Active constituent	Uses	Remarks
1.	Tulsi [*Ocimum sanctum L.* and *Ocimum basilicum L.*] 	Lamiaceae	Leaves	Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol, Carvacrol, Linalool, and β-caryophyllene	• Anti-aging, • Treats Kidney Stones, • Relieves Headaches, • Fights Acne.	• Relives Fever, • Eye Health, • Oral Health,. skin, liver, oral, and lung cancers
2.	Guggul [*Commiphora mukul,Commiphora wightii*] 	Burseraceae	Stem	Terpenoidal, steroids, sterols, amino acids, sugars, guggul tetrols and flavonoids.	Anti-inflammatory**,** eczema, psoriasis, and arthritis.	Weight loss,hypothyroidism,manage cholesterol,blood sugar levels.

3.	Curcumin [*Curcumin longa*] 	Zingiberaceae	Root	Curcumin, demethoxycurcumin, bisdemethoxycurcumin.	Alzheimer's, cancer, heart health.	Anti-inflammatory, antioxidant.
4.	Ashwagandha[*Withania somnifera*] 	Solanaceae.	Root, Leaf and Seed.	Withaferin-A, withanone.	Brain, reduce swelling, lower blood pressure.	Immune system, adaptogen, physical and mental stress.
5.	Achilles [*Yarrows*] 	Asteraceae.	Flowers.	Carvacrol, linalool, 1,8 cineol, p-ocimen.	Gastric ulcer, bleedings, headache, inflammation, pains.	Antiulcerogenic, spasmodic diseases, flatulence and dyspepsia.
6.	Glycyrrhizae [*Glycyrrhiza glabra linn*] 	Fabaceae.	Flowers, Root.	Glycyrrhetic acid, isoliquiritin, isoflavones.	Respiratory disorders, hyperdipsia, epilepsy, fever, sexual debility, paralysis.	Stomach ulcers, rheumatism, skin diseases, hemorrhagic diseases, jaundice.

Non-Small Cell Lungs Cancer[30 to 34]

NSCLC is any type of epithelial lung cancer other than small cell lung cancer (SCLC). The most common types of NSCLC are squamous cell carcinoma, large cell carcinoma, and adenocarcinomas, but there are several other types that occur less frequently, and all types can occur in unusual histological variants. Although NSCLCs are associated with cigarette smoke, adenocarcinomas may be found in patients who have never smoked.

Anatomy

NSCLC arises from the epithelial cells of the lung of the central bronchi to terminal alveoli. The histological type of NSCLC correlates with site of origin, reflecting the variation in respiratory tract epithelium of the bronchi to alveoli. Squamous cell carcinoma usually starts near a central bronchus. Adenocarcinomas and bronchiole alveolar carcinoma usually originate in peripheral lung tissue.

Pathogenesis

Smoking-related lung carcinogenesis is a multistep process. Squamous cell carcinoma and adenocarcinomas have defined premalignant precursor lesions. Before becoming invasive, lung epithelium may undergo morphological changes that include the following: Hyperplasia, metaphase, dysplasia, carcinoma.

Risk Factors

Increasing age is the most important risk factor for most cancers. Other risk factors for lung cancer include the following:

- History of or current tobacco use: cigarettes, pipes, and cigars.
- Exposure to cancer-causing substances in secondhand smoke.
- Occupational exposure to asbestos, arsenic, chromium, beryllium, nickel, and other agents.
- Radiation exposure from any of the following:

✓ Radiation therapy to the breast or chest.

✓ Radon exposure in the home or workplace.

✓ Medical imaging tests, such as computed tomography (CT) scans.

✓ Atomic bomb radiation.

- Living in an area with air pollution.
- Family history of lung cancer.
- Human immunodeficiency virus infection.

- Beta carotene supplements in heavy smokers.

Screening

In patients considered at high risk of developing lung cancer, the only screening modality for early detection that has been shown to alter mortality is low-dose helical CT scanning. Studies of lung cancer screening with chest radiography and sputum cytology have failed to demonstrate that screening with these modalities lowers lung cancer mortality rates.

Clinical Presentation

Lung cancer may present with symptoms or be found incidentally on chest imaging. The most common symptoms at presentation include the following: Worsening cough, chest pain, hemoptysis, malaise, weight loss, dyspnea, hoarseness.

Diagnosis

Investigations of patients with suspected NSCLC focus on confirming the diagnosis and determining the extent of the disease. Treatment options for patients are determined by histology, stage, and general health and co morbidities of the patient. The procedures used to determine the presence of cancer include the following-History, physical examination, routine laboratory evaluations, chest x-ray, chest CT scan with infusion of contrast material, biopsy.

Prognostic Factors

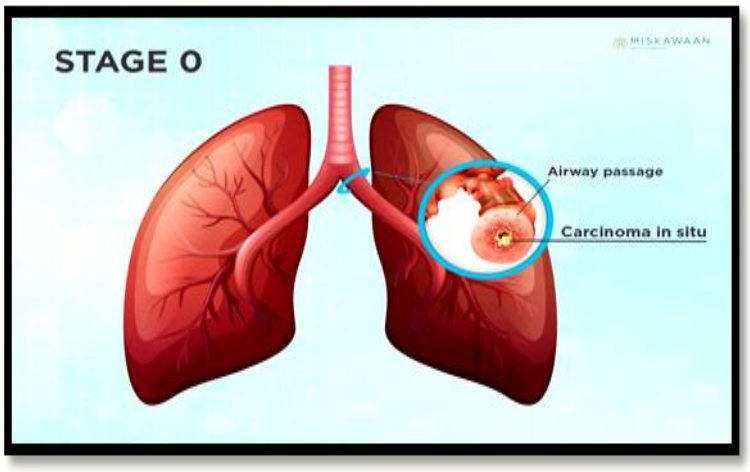
Multiple studies have attempted to identify the prognostic importance of a variety of clinic pathologic factors. Factors that have correlated with adverse prognosis include the following- Increasing stage, presence of pulmonary or constitutional symptoms, large tumor size (>3 cm), metastases to multiple lymph nodes within a TNM-defined nodal station, vascular invasion.

Non-small cell lungs cancer following stages[35]

- Occult (hidden) stage
- Stage I
- Stage II
- Stage III
- Stage IV

Occult (hidden) stage

Stage 0 non-small cell lung cancer (NSCLC) frequently progresses to invasive cancer. Patients may be offered surveillance bronchoscopes and, if lesions are detected, potentially curative therapies.



Treatment of Stage 0 Non-small cell lungs cancer[36 to 39]

- Standard Treatment Options for Stage 0 NSCLC.

Surgery, Endobronchial therapies.

Surgery

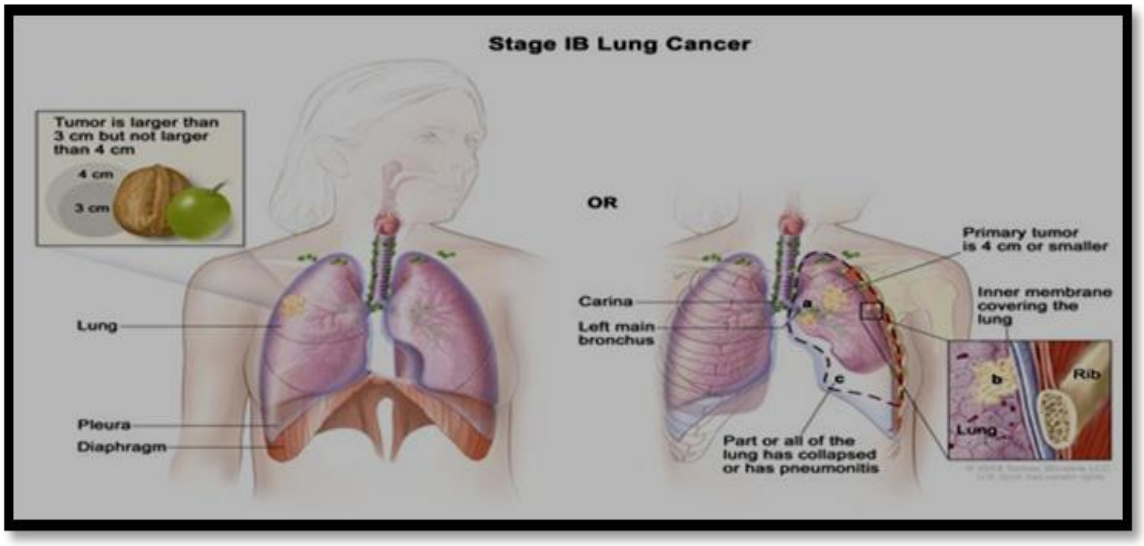
Segmentectomy or wedge resection is used to preserve maximum normal pulmonary tissue because patients with stage 0 NSCLC are at a high risk of second lung cancers. Because these tumors are by definition noninvasive and incapable of metastasizing, they should be curable with surgical resection; however, such lesions, when identified, are often centrally located and may require a lobectomy. Stage 0 NSCLC, treatments such as photodynamic therapy (PDT), laser therapy, or brachytherapy (internal radiation) may be alternatives to surgery.

Endobronchial therapies

Patients with central lesions may be candidates for curative Endobronchial therapy. Endobronchial therapies that preserve lung function include photodynamic therapy, electrocautery, cryotherapy.

Stage I

A stage I lung cancer is a small tumor that has not spread to any lymph nodes.



Treatment of Stage I Non-small cell lungs cancer[40 to 44]

1. Standard Treatment Options for Stage I.

Surgery, Adjuvant chemotherapy, Radiation therapy

Surgery

Surgery is the treatment of choice for patients with stage Ist NSCLC. A lobectomy or segmental, wedge, or sleeve resection may be performed as appropriate. Patients with impaired pulmonary function are candidates for segmental or wedge resection of the primary tumor. The immediate postoperative mortality rate is age related, but a 3% to 5% mortality rate with lobectomy can be expected. Surgery followed by targeted therapy with an EGFR tyrosine Kinase inhibitor, such as osimertinib.

Adjuvant chemotherapy

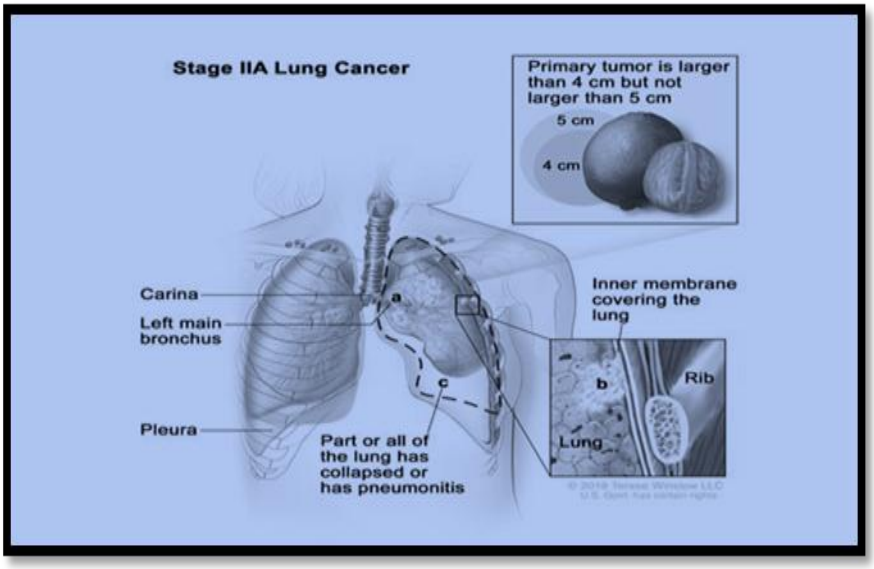
Based on a meta-analysis, postoperative chemotherapy is not recommended outside of a clinical trial for patients with completely respected stage I NSCLC.

Radiation therapy

A substantial number of patients are ineligible for standard surgical resection because of comorbid conditions that are associated with unacceptably high preoperative risk. Patients with potentially respectable tumors with medical contraindications to surgery or those with inoperable stage I disease and with sufficient pulmonary reserve may be candidates for radiation therapy with curative intent.

Stage II

The tumor is 5 centimeters or smaller and cancer has spread to the lymph nodes on the same side of the chest as the primary tumor.



Treatment of Stage II Non-small cell lung cancer[45 to 48]

- Standard Treatment Options for Stages II.

Surgery alone, Adjuvant chemotherapy, Radiation therapy.

Surgery alone

Surgery is the treatment of choice for patients with stage II NSCLC. A lobectomy, pneumonectomy, segmental resection, wedge resection, or sleeve resection may be performed as appropriate. In addition to the immediate and age-related postoperative mortality rate, a 5% to 8% mortality rate with pneumonectomy or a 3% to 5% mortality rate with lobectomy can be expected.

Adjuvant targeted therapy (for patients with EGFR mutations)

Adjuvant targeted therapy with Osimertinib for patients with *EGFR*-mutated (epidermal growth factor receptor) NSCLC and respected stage II NSCLC was studied in a phase III clinical trial and was found to significantly increase DFS

Radiation therapy

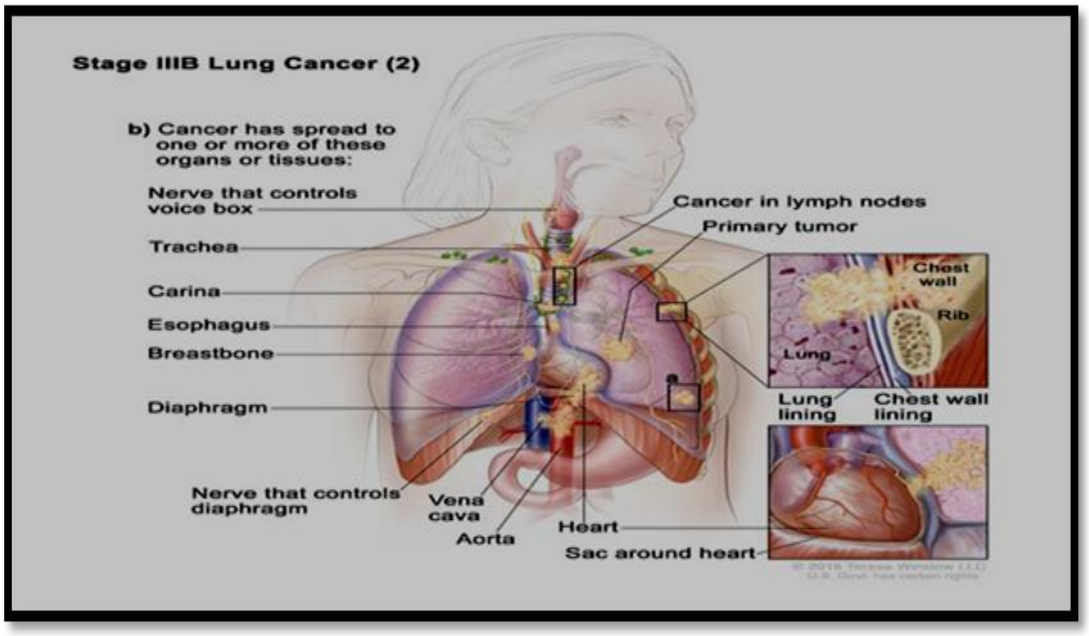
External beam radiation therapy- External beam radiation therapy (EBRT) focuses radiation from outside the body onto the cancer. This is the type of radiation therapy most

often used to treat NSCLC or its spread to other organs. Treatment is much like getting an x-ray, but the radiation dose is stronger. The procedure itself is painless and each treatment lasts only a few minutes. Most often, radiation treatments to the lungs are given 5 days a week for 5 to 7 weeks.

Brachytherapy (internal radiation therapy)- In people with NSCLC, brachytherapy is sometimes used to shrink tumors in the airway to relieve symptoms. The doctor places a small source of radioactive material (often in the form of small pellets) directly into the cancer or into the airway next to the cancer. This is usually done through a bronchoscope, but it may also be done during surgery. The radiation travels only a short distance from the source, limiting the effects on surrounding healthy tissues. The radiation source is usually removed after a short time. Less often, small radioactive "seeds" are left in place permanently, and the radiation gets weaker over several weeks.

Stage III

Stage III the tumor is 5 centimeters or smaller and cancer has spread to lymph nodes above the collarbone on the same side of the chest as the primary tumor or to any lymph nodes on the opposite side of the chest as the primary tumor.



Treatment of Stage III Non-small cell lungs cancer[49]

- Standard Treatment Options for Stages III.

Surgery, Chemoradiation therapy, Radiation therapy.

Surgery

If complete resection of tumor and lymph nodes is possible, such patients may benefit from surgery followed by postoperative chemotherapy. Current evidence suggests that lung cancer resection combined with complete ipsilateral mediastinal lymph node dissection (CMLND) is not associated with improvement in survival compared with lung cancer resection combined with systematic sampling of mediastinal lymph nodes in patients with stage I, II, or III NSCLC.

Chemoradiation therapy

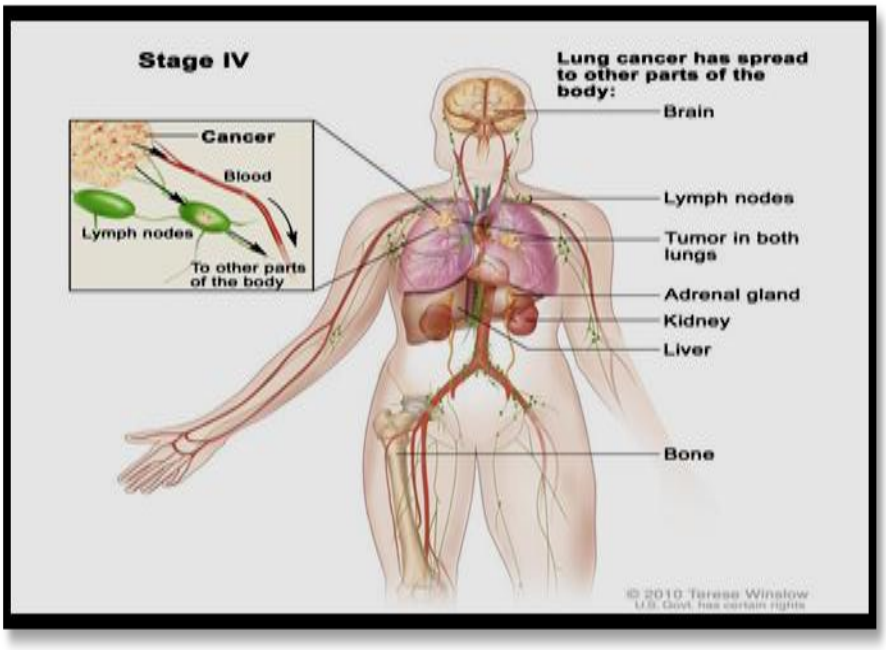
The chemotherapy with two carboplatin and taxol cycles, followed by concomitant chemo-radiotherapy, vs concomitant chemo-radiotherapy alone . Median survival in the chemo-radiotherapy arm was 11.4 months vs 14 in the induction arm (P=0.154), with one-year survival of 48% and 54%, respectively. The LAMP (Locally Advanced Multimodality Protocol) phase-II randomized study compared 276 stage IIIA and B patients, who were randomized to receive induction chemotherapy followed by radiotherapy, induction chemotherapy followed by concurrent chemo-radiotherapy or (a third arm) concurrent chemo-radiotherapy followed by chemotherapy. Concomitant platinum-based radiation chemotherapy may improve survival of patients with locally advanced NSCLC.

Radiation therapy

Treatment is much like getting an x-ray, but the radiation dose is stronger. The procedure itself is painless and each treatment lasts only a few minutes. Most often, radiation treatments to the lungs are given 5 days a week for 5 to 7 weeks, but this can vary based on the type of EBRT and the reason it's being given. **Stereotactic body radiation therapy (SBRT)** also known as stereotactic ablative radiotherapy (SABR), is most often used to treat early-stage lung cancers when surgery isn't an option due to a person's health or in people who don't want surgery. It might also be considered for tumors that have limited spread to other parts of the body, such as the brain or adrenal gland. **Intensity modulated radiation therapy (IMRT)** is a form of 3D therapy. Along with shaping the beams and aiming them at the tumor from several angles, the strength of the beams can be adjusted to limit the dose reaching nearby normal tissues. This technique is used most often if tumors are near important structures such as the spinal cord.

Stage IV

Stage IV of non-small-cell lung cancer, it means the disease has spread from the lungs to distant areas of patient body, such as the liver, brain, or bones. Although it usually can't be cured, there are a variety of treatments that can slow the cancer's growth and help you manage its symptoms.



Treatment of Stage IV NSCLC[50,51]

- Standard Treatment Options for Stages IV.

Chemotherapy, Immunotherapy

Chemotherapy

The use of chemotherapy has produced objective responses and small improvement in survival for patients with metastatic disease. In studies that have examined symptomatic response, improvement in subjective symptoms has been reported to occur more frequently than objective response. Informed patients with good performance status and symptomatic recurrence can be offered treatment with a platinum-based chemotherapy regimen for palliation of symptoms. For patients who have relapsed after platinum-based chemotherapy, second-line therapy can be considered.

Immunotherapy

Nivolumab is a fully human monoclonal antibody that inhibits the programmed death 1 (PD-1) co-inhibitory immune checkpoint expressed on tumor cells and infiltrating immune cells. Pembrolizumab is a humanized monoclonal antibody that inhibits the interaction between the programmed death-ligand 1 (PD-L1) co-inhibitory immune checkpoint expressed on tumor cells and infiltrating immune cells and its ligands, PD-L1 and PD-L2. Atezolizumab is a PD-L1–blocking antibody.

Allopathic medicines treating Non-Small Cell Lungs Cancer[53 to 54]

Sr.No.	Drug name	Brand name	Category of drug	Dose	Mode of actions	Uses	Remarks
1.	Nivolumab	Opdivo	Monoclonal antibodies	240 mg, 480 mg.	Preventing PD-L1,PD-L2,inhibiting of T-cell	Treat cancer	Immunotherapy.
2.	Bevacizumab	Avastin	Antiangiogenic agents	15 mg/kg	Selectively binding circulating VEGF	Brain tumor, kidney cancer, colon cancer, HCC.	Rectum cancer lung cancer, breast cancer.
3.	Ceritinib	Zykadia	Kinase inhibitors	300mg,150 mg.	Inhibiting autophosphorylation of ALK, ALK.	NSCLC.	Lung cancer.
4.	Crizotinib	Xalkori	Kinase inhibitors	250 mg	Inhibitor of receptor tyrosine kinases	Lung cancer, anaplastic large cell lymphoma - ALCL	Metastatic
5.	Ipilimumab	Yervoy	Monoclonal antibodies	1 mg/kg	Ipilimumab binds to CTLA-4, blocking the inhibitory signal.	Treat various cancers such as skin, kidney, liver, Lung, colorectal.	Melanoma, skin cancer, kidney Cancer,
6.	Dacomitinib	Vizimpro	Kinase inhibitors	30 mg	Oral Kinase inhibitor	Lung cancer	NSCLC
7.	Trametinib dimethyl sulfoxide	Mekinist	Kinase inhibitors	2 mg	Allosteric inhibitor of mitogen-activated extracellular signal regulated Kinase 1	Anaplastic thyroid cancer, “BRAF" gene mutation.	NSCLC, melanoma.
8.	Tepotinib hydrochloride	Tepmetko	Kinase inhibitors	450 mg/kg	Kinase inhibitor that targets MET	Metastatic non-small cell lung cancer	MET gene, stopping the growth of cancer cells
9.	Sotorasib	Lumakras	KRAS inhibitors	960 mg	Inhibitor of KRAS G12C	Lung cancer, metastatic	NSCLC
10.	Ramucirumab	Cyamza	Monoclonal antibodies	8mg/kg	Direct VEGFR2 antagonist	NSCLC, gastroesophageal junction cancer	Stomach cancer, colorectal cancer.

Herbal medicines treating non-small cell lungs cancer[55]

Sr.No.	Plant name [Biological source]	Family	Parts of plant	Active constituent	Uses	Remarks
1.	Fabaceae [*Astragalus propinquus schischkin*] 	Leguminosae	Root	Saponins, flavonoids, polysaccharides.	Immune system, preventing colds, diabetes.	Upper respiratory infections, lowering blood pressure.
2.	Adenophorae [*Ageratina adenophorum*] 	Campanulaceae	Root	Adenophorae Rad ix, Drug Eval.	Antitussive and expectorant, allaying a fever	Antimutation, restraining adenocarcinomas cell, strengthening cardiac function.
3.	Ophiopogonis [*Ophiopogon japonicus*] 	Asparagaceae	Root, Flowers	Steroidal saponins, homoisoflavonoid s, amino acids, nucleosides, polysaccharides	Promote fluid secretion, moisturize the lungs and skin	Relieve constipation
4.	Poria[*Poria cocas*]	Polyporaceae	Fungus, food	Sclerotium, called fu-ling or hoelen	Digestion, insomnia, depression, osteoporosis, and skin aging.,	Alzheimer's, cancer, and diabetes, diuretic, sedative.

						
5.	Semen persucae[*Red Semen persucae*] 	Rosaceae	Seed	Fructose, calcium, ascorbic acid, and certain enzymes	Heart, liver and large intestine meridian	Menischesis, dysmenorrhea, uterine and ab-dominal mass, injury.
6.	Artemisia absinthium [*Wormwood*] 	Asteraceae.	Leave, stem.	Lactones, terpenoids, essential oils, organic acids, resins, tannins, and phenols	Infectious diseases, Crohn's disease, and IgA nephropathy.	Digestive problems and worm infections.
7.	Ammi [*Visnaga khellin*] 	Apiaceae	Leave, flower seed.	khellin and visnagin	Asthma, bronchitis, cough, and whooping cough.	• Angina, • Atherosclerosis, • Bronchitis, • Colic, • Coughs, • Diabetes, • Heart disease.

Diet chart for Lungs Cancer[56]

Early Morning: Drink Lukewarm water 1-2 glass in empty stomach, before brushing teeth, drink Amla + Aloe Vera juice before breakfast**.**

Timing	Diet plan (Vegetarian)
Breakfast (08:30 AM)	1 glass of Milk with Turmeric/Haridrakhand powder (1 tsp), 1-2 biscuit Fiber rich Daliya (salted), Poha/upma (sujji), Sprouts/2 thin roti (Multi grains Atta)+1 bowl vegetable(boiled) +1 plate fruit Salad (Orange, Strawberries, papaya, Grapes, Banana, Apple, muskmelon, Avocado)
Lunch (12:30-01:30 PM)	1-2 thin Chapatti/Roti (Multi grains Atta) 1/2 bowl rice (mand/starch removed) + 1 bowl green vegetables (boiled) + 1 bowl daal (diluted with water)/1 plate salad.
Snacks (3:30-4:00PM)	1 glass boiled milk with Clove / 1 tsp Haridrakhand Powder/1 cup herbal tea + 1-2 biscuit fibrerich or Daliya/Upma (Sujji) /Vegetable soup
Dinner (7:00-8:00 PM)	1-2 thin Chapati/Roti (Multi grains Atta) + 1 bowl green vegetables (boiled) + 1 bowl daal (diluted with water)
30 Minute before Sleep (10:00 PM)	1 glass milk + 1 tsp of Turmeric + Ashwagandha Churna + Shatavri Churna/Haridrakhand powder.

Pathya (Do's)

Cereals: Old rice, maize, Millet, Oats, Wheat, barely.

Pulses: Green gram (moog daal), pigeon pea (arahara), Lentil (masoor Daal)

Fruits & vegetables: Bottle gourd (Lauki), ridge gourd (tori), pointed gourd (Parwal), Bitter gourd (Karela), Pumpkin (Kaddu), cauliflower, cabbage, broceli, trunip, radish, sweet potato, bean, carrot, tomato, Seasonal Green vegetables, carrot, radish, cucumber (khera), Orange, Papaya, grapes, Avaccoda, Apple.

Others: Ginger, Garlic, lemon, ripe, Jack fruit.

Life style

Yoga Pranayam and meditation: 1. Bhastrika 2. Bahyapranayaam 3. Anulom Vilom 4. Bhramari 5. Udgeeth 6. Ujjaayi 7. Pranav Jap

Asanas: Light Exercise

Apathya (Don'ts)

Cereals: Refined flour (maida), new rice. Pulses: Peas Matter), black gram(desi chana), kidney Beans, Chikpea

Fruits & vegetables: Brinjal, jackfruit, potato and other tuber mustard leaf vegetable.

Others: Spicy food, Kadhi, Curd, cheese, Excess salt, dust, smoke, cereals causing burning sensation and acidity with poor digestion (vidhai Anna), fish, Excessive use of oil and

clarified butter, Betel nut, extra salt cold food, contaminated/rotten food, unsuitable incompatible contaminated water, dry, Fried and difficult to digest food.

Strictly Avoidable: Oil spicy food, Non-Veg & Non-Veg Soup, ghee, excess salt, cold drinks, bakery products, alcohol, fast food, pickles, soft drinks, canned foods, junk foods

Life style: Adhyasana (Repetition of food intake after meals, within 1-2 hours repeating) Physical Exercise (intercourse) & excess heat/summer, suppression of natural urges, anger, anger, fear, hurry, worry, cold water, excessive intake of food, Day sleeping, suppression of natural urges.

Yoga Pranayam and meditation: As per doctors advise

Advice: 1 CUP herbal tea is issued or consumed by patients, in case if he/she is habitual of tea and coffee (It is substitute for it).

Do as regular: THANKS TO GOD FOR FOOD

1. Get up with the sunrise [5:30-6:30 AM]
2. Brush the teeth twice a day in the morning and before going to bed.
3. Scrape the tongue daily.
4. Meditate and do yoga.
5. Eat fresh light warm food slowly, in peaceful place with silent positive and happy mind.
6. Eat 3-4 times at regular time in a day. Don't skip meals & avoid overeating. Fast once in a week.
7. Eat leaving 1/3rd or 1/4th of stomach empty.
8. Chew food properly and slowly.
9. Walk 3-5 minutes after taking food.
10. Take a short walk after meal and sleep at proper time in night.
11. Use Tulsi, Cloves, Celery (Ajmod), Almond, Walnut
12. Black peeper and Moletji you have to chew slowly.
13. Adequate calories and warm food.

Prevention Lung Cancer

KEY POINTS

1. Avoiding risk factors and increasing protective factors may help prevent lung cancer.

2. The following are risk factors for lung cancer: Cigarette, cigar, and pipe smoking, secondhand smoke, family history, HIV infection, environmental risk factors, beta carotene supplements in heavy smokers
3. The following are protective factors for lung cancer: Not smoking, ouitting smoking, lower exposure to workplace risk factors, lower exposure to radon.
4. It is not clear if the following decrease the risk of lung cancer: Diet, physical activity
5. The following do not decrease the risk of lung cancer: Beta carotene supplements in nonsmokers, vitamin E supplements
6. Cancer prevention clinical trials are used to study ways to prevent cancer.
7. New ways to prevent lung cancer are being studied in clinical trials.

REFERENCES

1. https://www.cdc.gov/cancer/lung/basic_info/what-is-lung-cancer.htm
2. https://www.nhs.uk/conditions/lung-cancer/diagnosis
3. https://pearlpoint.org/i-have-lung-cancer-what-should-i-eat/
4. https://www.cancer.org/cancer/lung-cancer/treating-small-cell.html
5. https://www.urmc.rochester.edu/encyclopedia/content.aspx?contenttypeid=34&contentid=16333-1
6. https://apollocancercentres.com/cancers/lungcancer/?campaignid=15931942504&adgroupid=132952873632&network=g&device=c&gclid=Cj0KCQiAmKiQBhClARIsAKtSjnDDPzIdi8iJFJixVQQlBrSWmuwAcTrwAI_rL4k03imWWhqVckQb38aArKBEALw_wcB
7. https://www.cancer.org/cancer/lung-cancer/treating-non-small-cell/radiation-therapy.html
8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5871268/#:~:text=More%20than%20200%20species%20of,on%20cancer%20cell%20was%20shown.&text=Also%20in%20a%20clinical%20study,response%20to%20this%20plant's%20extract.
9. https://www.uchealth.com/wp-content/uploads/sites/2/2014/11/Lung-Cancer_Diet_Food-for-Thought.pdf
10. https://www.cdc.gov/cancer/lung/basic_info/prevention.htm#:~:text=The%20most%20important%20thing%20you,home%20and%20car%20smoke%2Dfree.
11. https://www.cancercenter.com/cancer-types/lung-cancer/types#:~:text=Small%20cell%20lung%20cancer%20is%20also%20known%20as%20%E2%80%9Coat%2Dcell,body%2C%20including%20the%20lymph%20nodes.
12. https://www.cancer.gov/types/lung/hp/non-small-cell-lung-treatment-pdq#_4

13. Small Cell Lung Cancer Treatment (PDQ®)–Patient Version National Cancer Institute Updated: May 7, 2021 https://www.cancer.gov/types/lung/patient/small-cell-lung-treatment-pdq
14. The State of Lung Cancer Research: A Global Analysis Ajay Aggarwal, MD, MSc,a, Grant Lewison, MD, PhDa Available online - 21 March 2016 International Association for the Study of Lung Cancer. Published by Elsevier Inc.
15. National Library of Medicine. https://medlineplus.gov/lungcancer.html
16. Book: Mayo Clinic Family Health Book, 5th Edition. https://www.mayoclinic.org/diseases-conditions/lung-cancer/diagnosis-treatment/drc-20374627
17. World Health Organization. Preventing Chronic Diseases: A Vital Investment. Geneva, Switzerland: World Health Organization, 2005.
18. Smeltzer SC, Bare BG, Hinkle JL, Cheever KH. Brunner and Suddarth's Textbook of Medical Surgical Nursing. 12th ed London, England: Wolters Kluwer, 2010; 205–231.
19. Kumar V, Abbas A, Aster J. Robbins Pathologic Basis of Disease. 9th ed Tehran, Iran: Arjomand, 2014.
20. Mousavi SM, Gouya MM, Ramazani R, Davanlou M, Hajsadeghi N, Seddighi Z. Cancer incidence and mortality in Iran. Ann Oncol, 2009; 20: 556–563.
21. Rafieian-Kopaie M, Nasri H. On the occasion of World Cancer Day 2015: the possibility of cancer prevention or treatment with antioxidants: the Ongoing Cancer Prevention Researches. Int J Prev Med., 2015; 6: 108. doi:10.4103/2008-7802.169077.
22. Lachenmayer A, Alsinet C, Chang CY, Liovit JM. Molecular approaches to treatment of hepatocellular carcinoma. Dig Liver Dis., 2010; 42: 264–272.
23. Newman DJ, Cragg GM. Natural products as sources of new drugs over the last 25 years. J Nat Prod., 2007; 70: 461–477.
24. American Cancer Society: Cancer Facts and Figures 2022. American Cancer Society, 2022. Available onlineExit Disclaimer. Last accessed January 12, 2022.
25. Alberg AJ, Ford JG, Samet JM, et al.: Epidemiology of lung cancer: ACCP evidence-based clinical practice guidelines (2nd edition). Chest., 2007; 132(3): 29S-55S.
26. Tulunay OE, Hecht SS, Carmella SG, et al.: Urinary metabolites of a tobacco-specific lung carcinogen in nonsmoking hospitality workers. Cancer Epidemiol Biomarkers Prev., 2005; 14(5): 1283-6.

27. Anderson KE, Kliris J, Murphy L, et al.: Metabolites of a tobacco-specific lung carcinogen in nonsmoking casino patrons. Cancer Epidemiol Biomarkers Prev., 2003; 12(12): 1544-6.
28. Straif K, Benbrahim-Tallaa L, Baan R, et al.: A review of human carcinogens--part C: metals, arsenic, dusts, and fibres. Lancet Oncol, 2009; 10(5): 453-4.
29. Friedman DL, Whitton J, Leisenring W, et al.: Subsequent neoplasms in 5-year survivors of childhood cancer: the Childhood Cancer Survivor Study. J Natl Cancer Inst., 2010; 102(14): 1083-95.
30. Gray A, Read S, McGale P, et al.: Lung cancer deaths from indoor radon and the cost effectiveness and potential of policies to reduce them. BMJ, 2009; 338: a3110.
31. Berrington de González A, Kim KP, Berg CD: Low-dose lung computed tomography screening before age 55: estimates of the mortality reduction required to outweigh the radiation-induced cancer risk. J Med Screen, 2008; 15(3): 153-8. [PUBMED Abstract]
32. Shimizu Y, Kato H, Schull WJ: Studies of the mortality of A-bomb survivors. 1950-1985 Cancer mortality based on the recently revised doses (DS86). Radiat Res., 1990; 121(2): 120-41.
33. https://www.cancer.net/cancer-types/lung-cancer-non-small-cell/risk-factors-prevention#:~:text=Although%20there%20is%20no%20proven,lowest%20risk%20of%20lung%20cancer.
34. https://www.cancer.gov/types/lung/patient/lung-prevention-pdq.
35. American Cancer Society. Cancer Facts and Figures 2015. Available online: http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc-044552.pdf
36. National Cancer Institute. SEER Cancer Statistics Review, 1975-2011. Available online: http://seer.cancer.gov/csr/1975_2011/
37. Sher T, Dy GK, Adjei AA. Small cell lung cancer. Mayo Clin Proc, 2008; 83: 355-67. [Crossref] [PubMed]
38. Kenfield SA, Wei EK, Stampfer MJ, et al. Comparison of aspects of smoking among the four histological types of lung cancer. Tob Control, 2008; 17: 198-204. [Crossref] [PubMed]
39. Noguchi M, Morikawa A, Kawasaki M, et al. Small adenocarcinoma of the lung. Histologic characteristics and prognosis. Cancer, 1995; 75: 2844-52. [Crossref] [PubMed]
40. Couraud S, Zalcman G, Milleron B, et al. Lung cancer in never smokers--a review. Eur J Cancer, 2012; 48: 1299-311. [Crossref] [PubMed]

41. Travis WD, Travis LB, Devesa SS. Lung cancer. Cancer, 1995; 75: 191-202. [Crossref] [PubMed]
42. Stellman SD, Muscat JE, Hoffmann D, et al. Impact of filter cigarette smoking on lung cancer histology. Prev Med., 1997; 26: 451-6. [Crossref] [PubMed]
43. Brambilla E, Pugatch B, Geisinger K, et al. Large cell carcinoma. In: Travis W, Brambilla E, Müller-Hermelink H, et al. editors. World Health Organization Classification of Tumours Pathology and Genetics of Tumours of the Lung, Pleura, Thymus and Heart. WHO Press, Geneva, 2004; 45-50.
44. Muscat JE, Stellman SD, Zhang ZF, et al. Cigarette smoking and large cell carcinoma of the lung. Cancer Epidemiol Biomarkers Prev, 1997; 6: 477-80. [PubMed]
45. Hecht SS. Tobacco smoke carcinogens and lung cancer. J Natl Cancer Inst, 1999; 91: 1194-210. [Crossref] [PubMed]
46. Whitrow MJ, Smith BJ, Pilotto LS, et al. Environmental exposure to carcinogens causing lung cancer: epidemiological evidence from the medical literature. Respirology, 2003; 8: 513-21. [Crossref] [PubMed]
47. U.S. Dept. of Health and Human Services. The Health Consequences of Smoking-50 Years of Progress. A Report of the Surgeon General, 2014. Available online: http://www.surgeongeneral.gov/library/reports/50-years-of-progress/
48. United States Environmental Protection Agency. Health Risk of Radon. Available online: https://www.epa.gov/radon/health-risk-radon
49. Krewski D, Lubin JH, Zielinski JM, et al. Residential radon and risk of lung cancer: a combined analysis of 7 North American case-control studies. Epidemiology, 2005; 16: 137-45.
50. Krewski D, Lubin JH, Zielinski JM, et al. A combined analysis of North American case-control studies of residential radon and lung cancer. J Toxicol Environ Health A, 2006; 69: 533-97.
51. Darby S, Hill D, Auvinen A, et al. Radon in homes and risk of lung cancer: collaborative analysis of individual data from 13 European case-control studies. BMJ, 2005; 330: 223.
52. Hodgson JT, Darnton A. The quantitative risks of mesothelioma and lung cancer in relation to asbestos exposure. Ann Occup Hyg, 2000; 44: 565-601.
53. https://thoracickey.com/overview-of-anatomy-and-pathophysiology-of-lung-cancer/
54. Ramalingam S, Belani C. Systemic chemotherapy for advanced non-small cell lung cancer: recent advances and future directions. Oncologist, 2008; 13: s5–13.

55. Hanna N, Neubauer M, Yiannoutsos C, McGarry R, Arseneau J, Ansari R, et al. Phase III study of cisplatin, etoposide, and concurrent chest radiation with or without consolidation docetaxel in patients with inoperable stage III non-small-cell lung cancer: the Hoosier Oncology Group and U.S. Oncology. *J Clin* Oncol, 2008; 26: 5755–60.
56. Soresi E, Clerici M, Grilli R, Borghini U, Zucali R, Leoni M, et al. A randomized clinical trial comparing radiation therapy v radiation therapy plus cis-dichlorodiammine platinum (II) in the treatment of locally advanced non-small cell lung cancer. *Semin Oncol,* 1988; 15: s20–5.
57. DAYANAND MAHARISHI Book of 'Patanjali Ayurved Hospital' (DIET CHART) patanjali yogpeeth phase-I, Edition: 2nd February, 2018 printed by – RISHI OFFSET PRINTERS, page no 23 to 24 and 99 to 101.