Cancer Essay, Research Paper

What Is Lung Cancer?

Most cancers are named after the part of the body where the cancer first starts. Lung cancer begins in the lungs. The lungs are two sponge-like organs in the chest. The right lung has three sections, called lobes. The left lung has two lobes. It is smaller because the heart takes up more room on that side of the body. The lungs bring air in and out of the body, taking in oxygen and getting rid of carbon dioxide gas, a waste product.

The lining around the lungs, called the pleura, helps to protect the lungs and allows them to move during breathing. The windpipe (trachea) brings air down into the lungs. It divides into tubes called bronchi, which divide into smaller branches called bronchioles. At the end of these small branches are tiny air sacs known as alveoli.

Most lung cancers start in the lining of the bronchi but they can also begin in other areas such as the trachea, bronchioles, or alveoli. Lung cancer often takes many years to develop. Once the lung cancer occurs, cancer cells can break away and spread to other parts of the body. Lung cancer is a life-threatening disease because it often spreads in this way before it is found.

Imaging tests: these tests use x-rays, magnetic fields, sound waves or radioactive substances to create pictures of the inside of the body. Some of the imaging tests used to find lung cancer and to see where in the body it may have spread include x-rays, CT scan (computed tomography), MRI (magnetic resonance imaging), PET (positron emission tomography) scans, and bone scans.

Sputum cytology: a sample of phlegm (spit) is looked at under a microscope to see if cancer cells are present.

Needle biopsy: a needle is placed into the tumor to remove a piece of tissue. The tissue is looked at in the lab to see if cancer cells are present.

Bronchoscopy: a lighted, flexible tube is passed through the mouth into the bronchi. This test can help find tumors or it can be used to take samples of tissue or fluids to see if cancer cells are present.

Mediastinoscopy: with the patient asleep, tissue samples are taken from the lymph nodes along the windpipe through a small hole cut into the neck. Again, looking at the tissue under a microscope can show if cancer cells are present.

Bone marrow biopsy: a needle is used to remove a small piece of bone, usually from the back of the hip bone. The sample is checked for cancer cells.

Blood tests: certain blood tests are often done to help see if the lung cancer has spread to the liver or bones.

Types of Lung Cancer

There are two major types of lung cancer. The first is small cell lung cancer, or SCLC. The other is non-small cell lung cancer, or NSCLC. If the cancer has features of both types, it is called mixed small cell/large cell cancer.

Small cell lung cancer accounts for about 20% of all lung cancers. Although the cancer cells are small, they can multiply quickly and form large tumors. The tumors can spread to the lymph nodes and to other organs such as the brain, the liver, and the bones. Small cell lung cancer is usually caused by smoking. Other names for small cell lung cancer are oat cell cancer and small cell undifferentiated carcinoma.

Non-small cell lung cancer is the most common type of lung cancer, accounting for almost 80% of lung cancers. There are three subtypes within this group. Some types grow more quickly than others. Ask your doctor to explain which of these you have.

There are a few other rare types of lung cancer not covered in this document

After the Tests: Staging

Staging is the process of finding out how far the cancer has spread. This is very important because your treatment and the outlook for your recovery depend on the stage of your cancer. There are different staging systems for small cell and non-small cell lung cancer.

Small cell lung cancer staging

For small cell lung cancer a two-stage system is most often used. These are limited stage and extensive stage. Limited stage usually means that the cancer is only in one lung and in lymph nodes on the same side of the chest.

If the cancer has spread to the other lung, to lymph nodes on the other side of the chest, or to distant organs, it is called extensive. Small cell lung cancer is staged in this way because it helps to determine the best treatment for each group. Many people with small cell lung cancer will already have extensive disease when it is found.

Non-small cell lung cancer staging

The staging system most often used for non-small cell lung cancer is the TNM system, also known as the American Joint Committee on Cancer (AJCC) system.

T stands for tumor (its size and how far it has spread within the lung and to nearby organs)

N stands for spread to lymph nodes

M stands for metastasis (spread to distant organs)

All of this information is combined and a stage is assigned. The stages are described using Roman numerals 0-IV (1-4). In general, the lower the number, the less the cancer has spread. A higher number, such as stage IV (4), means a more serious cancer.

After looking at your test results, the doctor will tell you the stage of your cancer. Be sure to ask your doctor to explain your stage in a way you understand. This will help you both decide on the best treatment for you.

Treatment for Lung Cancer

There is a lot for you to think about when choosing the best way to treat or manage your cancer. There may be more than one treatment to choose from. You may feel that you need to make a decision quickly. But give yourself time to absorb the information you have learned. Talk to your doctor. Look at the list of questions at the end of this piece to get some ideas. Then add your own.

You may want to get a second opinion. Your doctor should not mind your doing this. In fact, some insurance companies require you to get a second opinion. You may not need to have tests done again since the results can often be sent to the second doctor. If you are in an HMO (health maintenance organization), find out about their policy concerning second opinions.

The treatment options for lung cancer are surgery, radiation therapy, and chemotherapy, either alone or in combination, depending on the stage of the tumor.

Surgery

Depending on the type and stage of the cancer, surgery may be used to remove the tumor and some of the lung tissue around it. If a lobe (section) of the lung is removed, the surgery is called a lobectomy. Removing only part of the lobe is called a wedge resection. If the entire lung is removed, the surgery is called a pnuemonectomy.

These operations are done with the patient asleep. A hospital stay of one or two weeks is usually needed. There will be some pain after the surgery because the surgeon has to cut through the ribs to get to the lungs.

People whose lungs are in good condition (other than the cancer) can often return to normal activities after a lobe or even an entire lung is removed. However, if they also have diseases such as emphysema or chronic bronchitis (common among heavy smokers), then they may have long-term shortness of breath.

For people who can’t have the usual surgery because of lung disease or other medical problems, or because the cancer is widespread, other types of surgery (for example, laser surgery) can be done to relieve symptoms.

Chemotherapy

Chemotherapy refers to the use of drugs to kill cancer cells. Usually the drugs are given into a vein or by mouth. Once the drugs enter the bloodstream, they spread throughout the body.Often several drugs are given at the same time. Depending on the type and stage of lung cancer, chemotherapy may be given as the main treatment or in addition to surgery.

Chemotherapy can have some side effects. These side effects will depend on the type of drugs given, the amount taken, and how long treatment lasts. Common side effects could include nausea and vomiting, loss of appetite, temporary hair loss, mouth sores, an increased risk of infections, and fatigue.

Anyone who has problems with side effects should talk with their doctor or nurse as there are often ways to help.

Radiation Therapy

Radiation therapy is treatment with high energy rays (such as x-rays) to kill or shrink cancer cells. The radiation may come from outside the body (external radiation) or from radioactive materials placed directly in the tumor (internal or implant radiation). External radiation is the type most often used to treat lung cancer.

Radiation is sometimes used as the main treatment of lung cancer, for example, for those people who may not be healthy enough to have surgery. For other patients, radiation might be used after surgery to kill small areas of cancer that can’t be seen and removed during surgery. Radiation can also be used to relieve symptoms such as pain, bleeding, and trouble swallowing.

Side effects of radiation therapy could include mild skin problems, nausea, vomiting, and tiredness. Often these go away after a short while. Chest radiation may cause lung damage and difficulty breathing. Side effects of radiation therapy to the brain (to treat metastasis) usually become most serious one or two years after treatment, and include headaches and trouble with thinking. Be sure to talk with your doctor if you have any side effects.

Types of Treatment for Lung Cancer

Surgery: Depending on the type and stage of a lung cancer, surgery may be used to remove the cancer and some of the surrounding lung tissue. If a lobe (section) of the lung is removed, it is called a lobectomy. If the entire lung is removed, the surgery is called a pneumonectomy. Removing part of a lobe is known as a segmentectomy or wedge resection. These operations involve general anesthesia (the patient is “asleep”) and a thoracotomy, making a surgical incision in the chest. The patient usually returns home after one to two weeks in the hospital. Possible complications include excessive bleeding, wound infections, and pneumonia. Because the surgeon must cut through ribs to get to the lung, these will hurt for some time after surgery. There will be some limitations to strenuous activity for at least a month.

People whose lungs are in good condition (other than the presence of the cancer) can usually return to normal activities after removal of a lobe or even an entire lung. However, if the lungs are also affected by noncancerous diseases such as emphysema or chronic bronchitis (which are common among heavy smokers), removal of a lobe or more extensive surgery may lead to long-term shortness of breath. Pulmonary function tests are done before surgery to determine whether the patient will have enough healthy lung tissue remaining after surgery.

If patients are unable to undergo a thoracotomy because of lung disease or other serious medical problems, or if the cancer is widespread, other types of surgery can be used to relieve some symptoms. For example, laser surgery can be used to relieve blockage of airways that may cause pneumonia or shortness of breath.

Some patients with lung cancers that have spread to certain sites like the brain may benefit from removal of a brain metastasis. This involves a craniotomy (surgery through a hole in the skull). It should only be done if the tumor can be removed without damage to the brain.

Chemotherapy: Chemotherapy uses anticancer drugs that are given into a vein or by mouth. These drugs enter the bloodstream and reach all areas of the body, making this treatment useful for cancer that has spread or metastasized to organs beyond the lung. Depending on the type and stage of lung cancer, chemotherapy may be given as the main (primary) treatment or as an addition (adjuvant) to surgery. Chemotherapy for lung cancer generally uses a combination of anticancer drugs.

Cisplatin or a related drug, carboplatin, are the chemotherapy drugs most often used in treating NSCLC. Recent studies found that combining either of these with drugs such as gemcitabine, paclitaxel, docetaxel, etoposide, or vinorelbine appear to be more effective in treating NSCLC. The best ways to combine these drugs together is still being tested in clinical trials.

Some of the usual chemotherapy combinations used for patients with SCLC include EP (etoposide and cisplatin), ET (etoposide and carboplatin), ICE (ifosfamide, carboplatin, and etoposide), and CAV (cyclophosphamide, doxorubicin, and vincristine). New drugs such as gemcitabine, paclitaxel, vinorelbine, topotecan, and teniposide have shown promising results in some SCLC studies. For those patients in relatively good health, some doctors are giving larger doses of chemotherapy along with drugs called growth factors. These help prevent the bone marrow effects of the chemotherapy which are described below.

Chemotherapy drugs kill cancer cells but also damage some normal cells. Therefore, careful attention must be given to avoiding or minimizing side effects which depend on the type of drugs, the amount taken, and the length of treatment. Temporary side effects might include nausea and vomiting, loss of appetite, loss of hair, and mouth sores. Because chemotherapy can damage the blood-producing cells of the bone marrow, patients may have low blood cell counts. This can result in an increased risk of infection (due to a shortage of white blood cells), bleeding or bruising after minor cuts or injuries (due to a shortage of blood platelets), and fatigue or shortness of breath (due to low red blood cell counts). Since nerves can be damaged by cisplatin, patients often feel numbness, particularly in their fingers and toes, and sometimes some weakness of their arms and legs.

Some side effects disappear within a few days after treatment. There are remedies for many of these temporary side effects of chemotherapy. For example, antiemetic drugs can be given to prevent or reduce nausea and vomiting.

Radiation Therapy: Radiation therapy uses high energy radiation to kill cancer cells. External beam radiation therapy uses radiation delivered from outside the body that is focused on the cancer. This is the type of radiation therapy most often used to treat a primary lung cancer or its metastases to other organs.

Brachytherapy uses a small pellet of radioactive material placed directly into the cancer or into the airway next to the cancer. Radiation therapy is sometimes used as the main (primary) treatment of lung cancer, especially in some patients, whose general health is too poor to undergo surgery. Brachytherapy can be used to help relieve blockage of large airways by cancer.

After surgery, radiation therapy can be used to kill very small deposits of cancer that cannot be seen and removed during surgery. Radiation therapy can also be used to palliate (relieve) symptoms of lung cancer such as pain, bleeding, difficulty swallowing, and problems caused by brain metastases.

Side effects of radiation therapy may include mild skin problems, nausea, vomiting, and fatigue. Often these go away after a short while. Radiation may also make the side effects of chemotherapy worse. Chest radiation therapy may cause lung damage and lead to difficulty breathing and shortness of breath. The swallowing tube (esophagus) runs through the middle of the chest and will be exposed to radiation. For this reason, there will also be difficulty with swallowing during the treatment, which improves shortly after it is over. Radiation therapy to large areas of the brain can sometimes result in significant changes in brain function. Symptoms may include memory loss, headache, difficulty thinking, or diminished sexual desire. Usually these symptoms are minor compared to those caused by a brain tumor; nevertheless, they can impact negatively on the patient’s quality of life. Side effects of radiation therapy to the brain usually become most serious one or two years after.

Treatment Choices by Stage and Type of Lung Cancer

Non-small cell lung cancer

Stage 0: Because stage 0 cancers are limited to the lining layer of air passages and have not invaded the nearby lung tissue, they are curable by surgery alone. No chemotherapy or radiation therapy is needed. They are usually treated by segmentectomy or wedge resection (surgical removal of defined segments or small wedges). Cancers in some locations (where the windpipe divides into the left and right main bronchi) are difficult to remove completely by surgery without also removing an entire lung. Endoscopic photodynamic therapy (killing cancer cells by sensitizing them with an injected chemical and activating the chemical by shining a bright light directly on the cancer) is being tested in this situation and may be a useful alternative to surgery for stage 0 cancers.

Stage I: Most patients with stage I NSCLC have their cancer surgically removed by a lobectomy (removal of one lobe) or by some less extensive surgery such as segmentectomy or wedge resection. The value of additional (adjuvant) chemotherapy after surgery for stage I NSCLC is being studied in clinical trials. Segmentectomy or wedge resection is recommended only for treating the smallest stage I cancers and for patients with other medical conditions that make removing the entire lobe dangerous. Most surgeons believe it is better to perform a lobectomy if the patient can tolerate it.

Radiation therapy is also used as the primary (main) treatment for some patients with serious medical problems that prevent them from undergoing surgery. Photodynamic therapy is being studied in clinical trials as an option for these patients. This treatment involves a drug that accumulates in the cancer and makes malignant cells very sensitive to a powerful light aimed through a bronchoscope. The combination of the drug and light kills cancer cells with minimal damage to normal brochical cells.

Chemoprevention trials (drugs studied to prevent tumors in subjects at high risk) for these patients are also in progress. These are being done in patients whose stage I NSCLC is curable but who are at risk for developing a second lung cancer.

The greatest risk for patients with stage I NSCLC is that micrometastases (deposits of cancer too small to be detected by imaging tests) are present even when surgeons believe that the lung tumor has been completely removed. The value of adjuvant chemotherapy after surgical removal of stage I NSCLC or after primary radiation therapy has not been proven, but clinical trials with chemotherapy intended to destroy micrometastases are in progress.

Five year survival rates for people with NSCLC in this stage who undergo surgery average about 60%.

Stage II: As in stage I NSCLC, most patients with stage II NSCLC have their cancer surgically removed by lobectomy or by some less extensive surgery such as a segmentectomy or wedge resection for those people who cannot withstand lobectomy.

Radiation therapy may be used to destroy cancer cells left behind after surgery if cancer cells are present at the edge of the tissue removed by surgery. Even if the edges of the sample have no detectable cancer cells, some doctors may recommend additional radiation therapy.

Radiation therapy alone can be used for patients who cannot undergo surgery due to other serious health problems.

The role of adjuvant chemotherapy for completely resected Stage II lung cancer is being studied in clinical trials. It may also be used for patients who cannot tolerate surgery and are treated with radiation only.

Five-year survival rates are about 35% for patients who are treated with surgery.

Stage IIIA: Treatment of stage IIIA NSCLC depends on the location of the cancer in the lung and if it has spread to lymph nodes.

Surgery may be used alone, if the surgeon thinks all the cancer can be removed successfully. Sometimes chemotherapy or radiation therapy or a combination of both will follow the surgery. Some doctors will recommend that chemotherapy or radiation therapy or both be given before surgery, with the goal of shrinking the tumor enough that it can be completely removed by surgery. If surgery is not performed, either because chemotherapy did not shrink the cancer enough or because the patient has other serious medical conditions and could not withstand surgery, the cancer can be treated by radiation therapy or by both radiation therapy and additional chemotherapy. There are several clinical trials in progress to determine the best treatment for people with this stage of lung cancer.

Brachytherapy is sometimes used. In some cases, a laser can be passed through a bronchoscope to destroy part of the cancer within the airway.

Average five year survival rates vary in the range of 10% to 20%, but some stage IIIA patients (such as those without lymph node metastases) may have a better outlook.

Stage IIIB: Stage IIIB NSCLC has spread too widely to be completely removed by surgery. Overall five-year survival is about 5%, but patients in relatively good health can undergo combined chemotherapy and radiation therapy that offers a five-year survival rate of about 10% to 20%. In selected cases, surgery may be done after chemotherapy or radiation therapy. There are several clinical trials in progress to determine the best treatment for people with this stage of lung cancer.

Stage IV: Because Stage IV NSCLC has spread to distant organs, a cure is not possible. If any aggressive therapy is used, the goal of treatment should be clear to the patient and family. In patients in otherwise good health, chemotherapy can extend survival. Blockage of an airway by cancer may be treated by interstitial radiation therapy or by using a laser passed through a bronchoscope to destroy the part of the cancer within the airway. External beam radiation therapy can also treat complications of cancer in the lungs as well as problems from metastatic growth such as bone pain and nervous system symptoms.

Several reports have shown that chemotherapy prolongs the life of patients with stage IV lung cancer. It also improves their quality of life, even though there are side effects from the chemotherapy. Only 20% to 25% of people with stage IV lung cancer live one year.

For some patients, palliative care may be the best choice, perhaps in the setting of a good hospice program. Pain is a significant concern for patients with lung cancer. Growth of the cancer around certain nerves may cause severe pain. However, it is possible to effectively relieve this pain by medications. Sometimes radiation therapy will help. It is important that patients do not hesitate to take advantage of these treatments.

Once the doctor has found that a chemotherapy regimen is not working, palliative care may be the best option. A second kind of chemotherapy will rarely help people with lung cancer. People with incurable lung cancer should try to get the most out of their lives by making every day count. That means they should be as free of symptoms as possible. Clinical trials of new chemotherapy drugs or other new treatments such as immunotherapy or gene therapy are a worthwhile option that may benefit the individual patient as well as future patients.

Small Cell Lung Cancer (SCLC)

This type of cancer is usually staged as either limited or extensive. Studies show that this type of lung cancer has usually spread by the time it is found (even if that spread is not shown by x-rays and other imaging tests) so SCLC usually cannot be cured by surgery alone.

Limited stage: Most cases of limited stage SCLC are treated first with chemotherapy in which two or more chemotherapy drugs are given to kill cancer cells throughout the body. The standard treatment is either cisplatin or carboplatin combined with etoposide. There are trials in progress to determine whether adding the drug paclitaxel will improve the outcome. Many studies have been performed to determine whether radiation treatment to the chest (usually the middle where the cancer spreads to lymph nodes) will improve the results over chemotherapy alone. These studies have shown that radiation does provide a small benefit. However there is added toxicity when giving radiation therapy with chemotherapy.

Chest radiation therapy is not given to patients with severe lung diseases (in addition to their cancer) or some other types of serious health problems. These patients have a worse prognosis (outlook) than those who can tolerate both chemotherapy and chest radiation therapy. In a few patients whose SCLC is very localized, the lobe is removed by surgery and followed by combination chemotherapy.

The brain is a common place where SCLC spreads. If no prevention is done, about 50% of people with SCLC will have spread to their brain. For this reason, patients who have a good response to initial treatment may be given head radiation therapy before evidence of a brain metastasis appears. This can prevent or delay complications due to brain metastasis, and may slightly increase overall survival time. Several groups of doctors have reported that patients given brain irradiation may suffer side effects such as trouble with memory and clumsiness. It is not totally clear that these symptoms are a direct result of the radiation. Most doctors will recommend brain radiation therapy for people who have had a complete remission (all the apparent cancer is gone) after chemotherapy.

When most SCLC patients are treated with chemotherapy, with or without radiation therapy, their tumors will shrink and they experience remission. Sooner or later, though, most small cell lung cancer becomes resistant to treatment and the cancer begins to grow again.

The one-year survival rate for people with limited stage SCLC who receive treatment with chemotherapy and radiation therapy (this is the most favorable group) is 60%. It goes down to 30% at two years and 10% to 15% by five years. Because of this lack of success, doctors are studying other methods of treating these cancers. Clinical trials of new chemotherapy drugs or other new treatments such as immunotherapy or gene therapy are a worthwhile option that may benefit the individual patient as well as future patients.

Extensive stage: Extensive SCLC has a very poor outlook when left untreated. Chemotherapy may be used to treat symptoms and to extend short-term survival. Chemotherapy with two or more drugs can shrink tumors for about 70% to 80% of these patients. Once again, carboplatin or cisplatin along with etoposide are the usual drugs given. However, this cancer usually becomes resistant to treatment. Radiation therapy is sometimes used to control symptoms of growth within the lung or spread to the bones or brain. Preventive brain radiation therapy is sometimes given.

About 20 to 30% of people with extensive SCLC live one year. By two years, only about 5% are still alive. Only 1-2% of people with extensive SCLC survive five years after the cancer is found. For patients too ill to have chemotherapy, the best plan may be to provide supportive care. This would include treatment of pain, breathing problems, weight loss, and other symptoms. Pain is a significant concern for patients with lung cancer. Growth of the cancer around certain nerves may cause severe pain. However, it is possible to effectively relieve this pain by medications. Radiation therapy may also be helpful. It is important that patients do not hesitate to take advantage of these treatments. People with incurable lung cancer should try to get the most out of their lives by making every day count. That means people should be as free of symptoms as possible. It also means people should question whether treatment is not likely to help them. Clinical trials of new chemotherapy drugs or other new treatments such as immunotherapy or gene therapy are a worthwhile option that may benefit the individual patient as well as future patients.

Bibliography

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