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Review Article

LUNG CANCER INCIDENCE, SYSTEMIC REVIEW AND SURGICAL TREATMENTS

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ABSTRACT

Lung cancer is the leading cause of cancer death among men and the second leading cause of cancer death among women worldwide. The trend of lung cancer varies differently in sex, sex, age, race/ethnicity, socioeconomic status, and geography because of differences in historical smoking patterns. Pattern of lung cancer was found to be high in number in persons' who start smoking at an early age. Countries from low and middle-income countries account for more than 50% of lung cancers in the world. This article will report about the systemic review on the disease and available surgical interventions available to treat it. Providing an overall Knowledge utilizing a PICO method for benefit of anyone who seeks it through this article.

Key words: Lung cancer, Cancer incidence, Cancer mortality, Five-year relative survival, Age, race/ethnicity Trends.

INTRODUCTION

Worldwide, lung cancer is the leading cause of cancer death in men and the second leading cause of cancer death in women, with approximately 1.8 million new cases and 1.6 million deaths annually. [1] Not always but most often Lung cancer and smoking are related to each other affecting all races combined and in each of the four major racial and ethnic groups (white, black, Hispanic, and Asian and Pacific Islander) by sex. [1] Lung cancer is also the leading cause of cancer death in men and the second leading cause of cancer death (after breast cancer) in women worldwide. [2] Symptoms of lung cancer can be misdiagnosed as other diseases; symptoms can be coughing, wheezing, shortness of breath, and bloody mucus. It was estimated that 1.8 million new lung cancer cases and 1.6 million lung cancer deaths occurred in 2012 worldwide, accounting for about 19 % of all cancer deaths. [3] Calculation of incidence rate is done by calculating number of newly diagnosed cancer cases in a population during a specific time period, usually expressed as a rate per 100,000 persons. The numerator includes only cases diagnosed during the given time period, and only primary sites (i.e., metastatic cancers are not counted). The denominator includes only the population at risk for cancer.

Age-standardized rates (ASR) are used to compare cancer occurrence between two or more populations with different age structures. It is necessary to account for differences in population age distributions because the frequency of cancer generally increases with age (except for some types of cancers in children). For instance, crude (unstandardized) lung cancer incidence rates are much lower for men in Alaska (a young population) compared to men in Florida (an older population); however, once they are age adjusted, the rates are virtually the same. Age- standardized rates are constructed by taking a weighted average of the rates in each 5-year age group, where the weights are the proportion of persons in that age group in a defi ned "standard population."

Lung Cancer mortality is the number of cancer deaths in a population during a given time period, usually expressed as a rate per 100,000 persons. The numerator includes only deaths which occurred during the given time period, and the denominator includes only the population at risk for lung cancer. Incidence of survival can also be considered by cancer mortality rate. For cancers with universally high case fatality, such as lung and pancreatic cancers, mortality rates may sometimes be used as a proxy for incidence rates.

Cancer survival is the length of time a person lives following cancer diagnosis. Relative survival represents the percentage of cancer patients who are living after a specifi ed time period since cancer diagnosis compared to the expected survival of a cancer-free population of the same age, race, and sex.

Lung cancer takes decades to develop after smoking initiation, and is thus rare before age 30 and peaks in the elderly. Lung cancer rates tend to drop off after around 80 years, likely due to competing mortality from other causes or diminished accuracy of classification. [4]

Mortality patterns by age closely follow incidence patterns. In 2006–2010, mortality rates among men ranged from 0.6 per 100,000 among those 30–34 years to 522.8 among those 80–84 years. Mortality rates among women ranged from 0.5 per 100,000 among those 30–34 years to 291.2 among those 80–84 years. The median age at death from lung cancer for men and women combined was about 72 years, with about 9 % of

deaths occurring among those younger than 55 years, 50 % in those 55–74 years, and 41 % in those 75 years and over. [5]

During 2006–2010, male lung cancer incidence rates were highest among blacks (94.7 per 100,000), followed by non-Hispanic whites (82.9 per 100,000), American Indians/Alaska Natives (70.2 per 100,000), Asians/Pacifi c Islanders (48.8 per 100,000), and Hispanics (45.9 per 100,000) (Fig. 2). among women, incidence rates were highest among non-Hispanic Whites (59.9 per 100,000), followed by American Indians/Alaska Natives (52.1 per 100,000), Blacks (50.4 per 100,000), Asians/Pacific Islanders (28.0 per 100,000), and Hispanics (26.6 per 100,000) (Fig. 2). These differences primarily reflect historical smoking patterns. Historically, black men smokedat higher rates than white men and men of other racial/ethnic groups. However, it is worth noting that signifi can't heterogeneity in lung cancer rates exist within these broad racial/ethnic groups according to geography and subpopulation. [6]

Among Asian Americans, lung cancer incidence rates in 2004–2008 ranged from 30.1 per 100,000 among Asian Indian and Pakistani men to 73.4 among Vietnamese men, while they ranged from 12.1 per 100,000 among Asian Indian and Pakistani women to 31.8 among Vietnamese women. [7]

From 2001 to 2010, rates decreased annually by an average of 3.3 % in Black males, 2.8 % in Hispanics, 2.4 % in Whites, and 1.6 % in Asians/Pacifi c Islanders, while rates were stable in American Indians/Alaska Natives [8]

Among females, lung cancer mortality rates are decreasing among all racial/ethnic groups except American Indians/ Alaska Natives and Asians/Pacific Islanders (Fig. 4). From 2001 to 2010, rates decreased annually by an average of −1.1 % in Hispanic females, −1.0 % in Black females, and −0.9 % in Whites, while rates remained stable in American Indians/ Alaska Natives and Asians/Pacific Islanders [8]

Lung cancer mortality rates among females have historically been lower than males, peaking at about 40 deaths per 100,000, or about half of the peak rate of 90 deaths per 100,000 among males (Fig. 3). These patterns are similar when broken down by racial/ethnic group.

Lung cancer survival is low and has seen only marginal increases since the mid- 1970s. [9] Cancer survival depends largely on stage at diagnosis. For lung cancer patients diagnosed in 2003–2009, the 5-year relative survival rate was 54 % for localized stage disease, 26 % for regional stage, and 4 % for distant stage. [9] However, only 15 % of cases were diagnosed at the localized stage, while 22 % were diagnosed at the regional stage and 57 % were diagnosed at the distant stage. Survival is lower in blacks (14 %) than in whites (18 %) because blacks are less likely to receive standard treatment and are more likely to be diagnosed at an advanced stage. Survival also declines with age. The 5-year relative survival rate for those diagnosed before the age of 45 is 27 %, compared to 19 % among those diagnosed at ages 55–64 and 12 % among those diagnosed at age 75 or greater. However, the survival rate for lung cancer is poor and does not vary a great deal between high- income and low- and middle-income countries, although high-income countries may have slightly better survival rates due to improved detection and access to treatment. For example, 5-year relative survival for lung cancer is 7 % in India and 9 % in Thailand, compared to 17 % in Australia and 18 % in Canada. [10]

Screening:

Lung cancer can be difficult to diagnose, resulting in delays that may adversely affect survival; rapid diagnosis and treatment therefore is critical for enabling improved patient outcomes Screening of lung cancer is done with low-dose computed tomography (LDCT) in adults of age 55 to 80 years who have a 30 pack-year smoking history and are currently smoking or have quit within the past 15 years. Both policy-level and clinical decision-making about LDCT screening must consider the potential benefits of screening (reduced mortality from lung cancer) and possible harms. Other screening option for the disease diagnosis are chest radiology (CXR), sputum cytology (SC), computed tomographic lymphography (CTLG), and the magnetic method has also been done but it isn't Not yet become a routine medical procedure in lung cancer.

Types of lung cancers:

Small cell lung cancer: This type of lung cancer may be aggressive and may require immediate treatment.

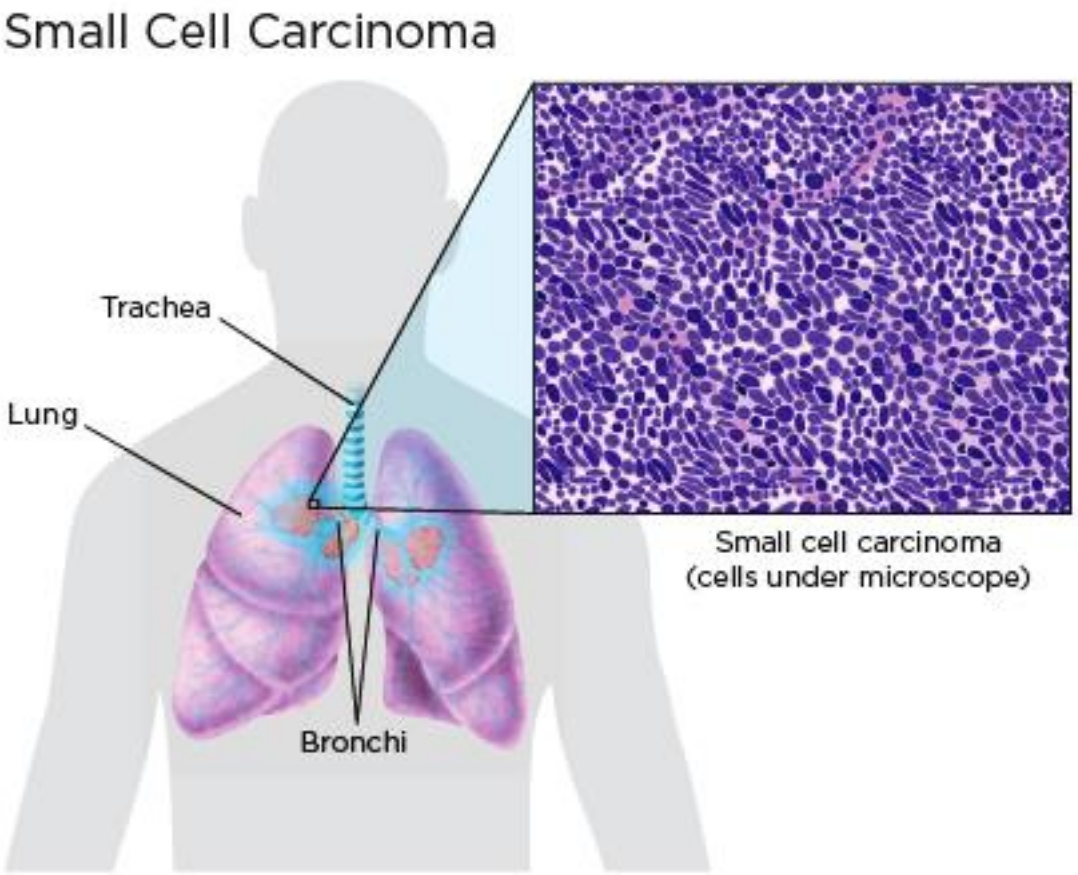

Figure 1: Small cell lung carcinoma

Non-small cell lung cancer: This is the most common form of lung cancer.

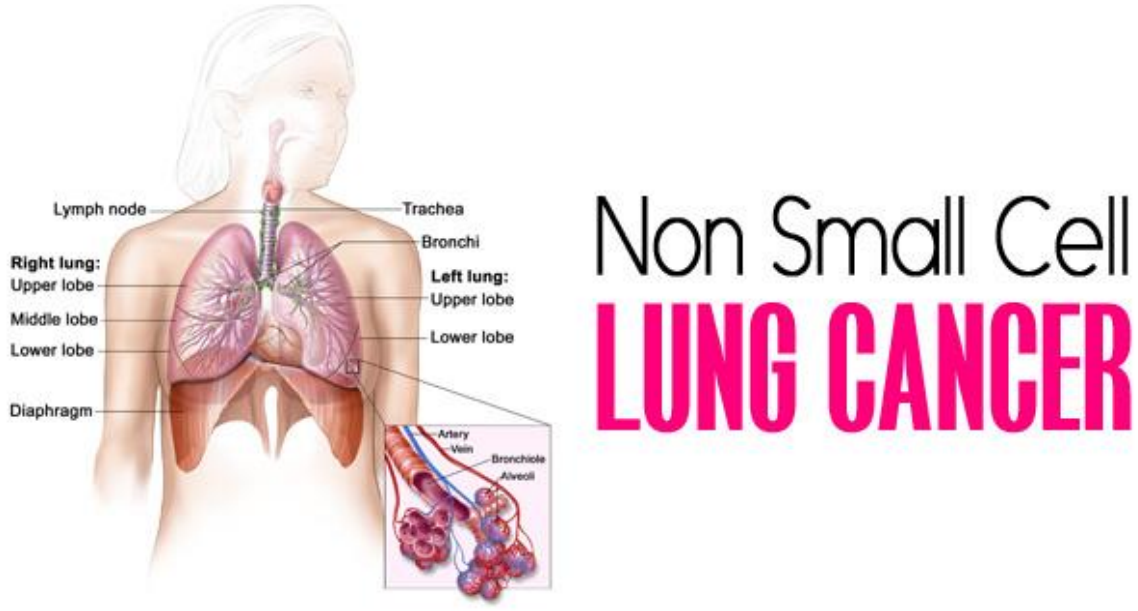

Figure 2: Non-small cell lung carcinoma

Metastatic lung cancer: In general, metastatic cancers are treated based on which part of the body the cancer first formed, so metastatic lung cancer is often treated as an advanced form of the disease, even if it spread to distant parts of the body.

Figure 3: Metastatic lung carcinoma

Figure 4: Metastatic locations for lung carcinomas'

Surgical Treatment:

The most common form of surgery for lung cancer is referred to as a thoracotomy and involves a partial or total removal of a lung. Other forms of surgery for lung cancer, includingradiofrequency ablation (RFA) and laser therapy, are used to kill cancer cells without removing the lung tissue.

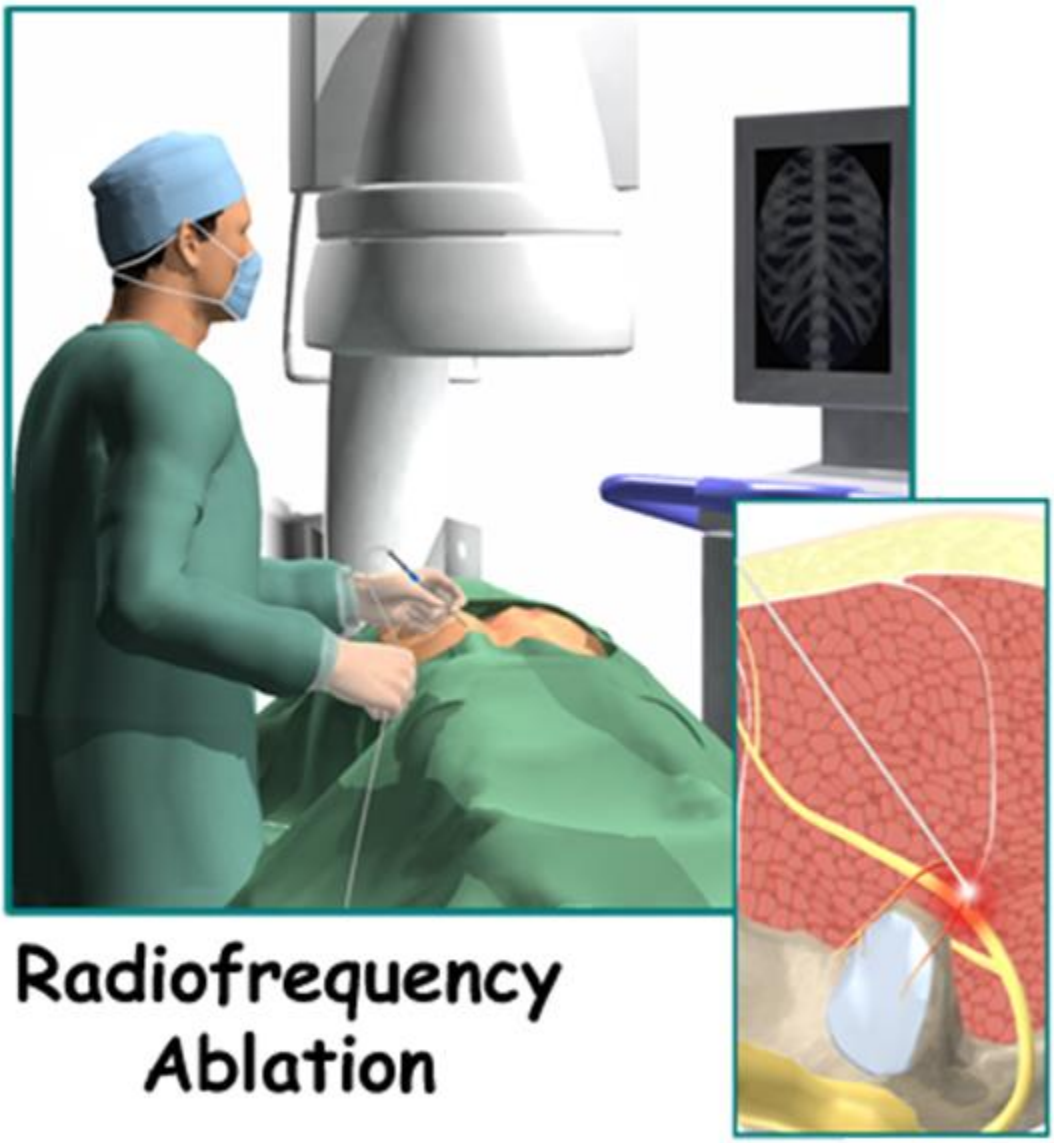

Figure 5: Radiofrequency ablation of lung carcinoma

A thoracotomy is the most common surgery for lung cancer. In this procedure, a surgical incision is made into the chest wall to expose the lungs. A thoracotomy can be done to confirm the diagnosis of lung cancer or to remove the cancerous portion of the lung. There are three different types of thoracotomy, known as segmentectomy, lobectomy, and pneumonectomy.

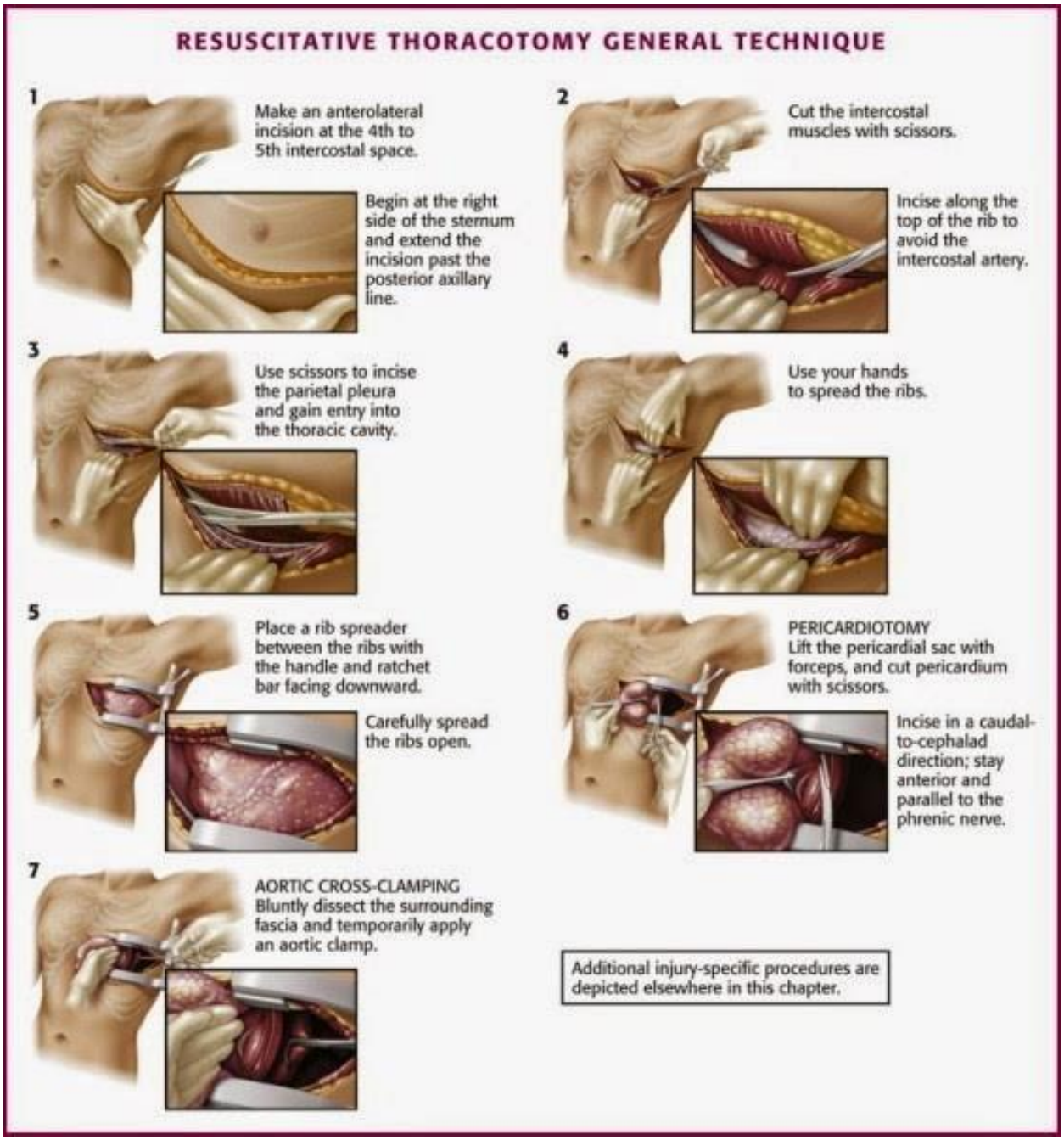

Figure 6: Thoracotomy

A segmentectomy, also referred to as a wedge resection, is a procedure in which the surgeon removes a wedge-shaped piece of lung tissue. This segment of lung tissue contains the cancerous portion of the lung as well as surrounding healthy tissue. This method is typically used when the surgeon is relatively confident that all of the cancer can be removed in this manner, though the chances of the cancer returning are higher with this method than in the other thoracotomy methods.

In a lobectomy, an entire lobe of the lung is removed. There are three lobes on the right lung and two on the left. Removing the cancerous lobe of the lung has no effect on overall lung function. In more extreme cases, a pneumonectomy may become necessary. This type of surgery for lung cancer involves removing an entire lung and will decrease lung function.

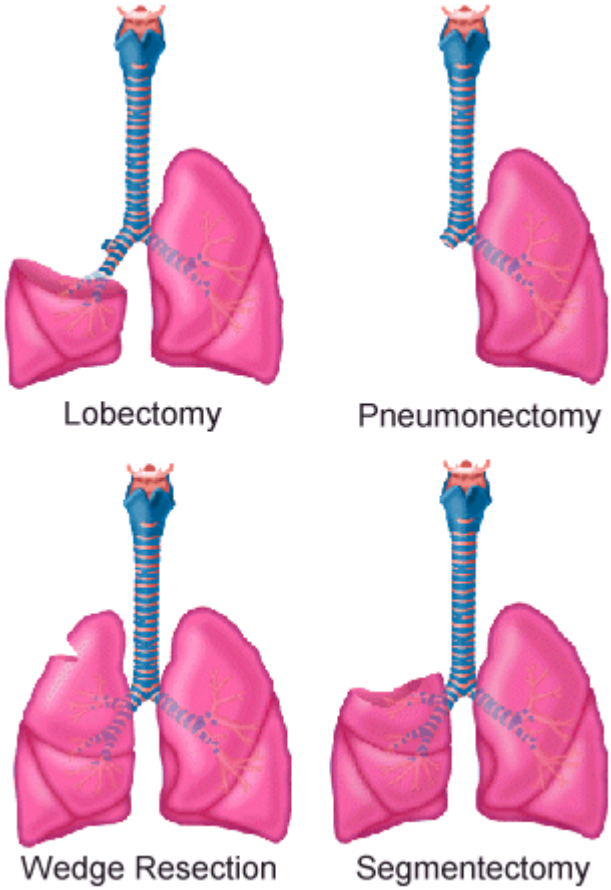

Figure 7: Surgical techniques for lung carcinoma

Radiofrequency ablation is another type of surgery for lung cancer. In this procedure, a small needle is passed through the skin and into the tumor on the lung. Energy is passed through the needle and into the tumor, killing the cancerous cells. The surrounding blood vessels are also closed by the heat from this treatment, reducing the amount of bleeding.

Laser therapy is another available type of surgery for lung cancer. Laser therapy uses a beam of light to destroy cancerous cells. This form of therapy is typically used when the tumor is blocking the airway and needs to be removed so the patient can breathe. This method of treatment does not actually cure lung cancer.

Video-assisted thoracic surgery (VATS): VATS is a minimally invasive technology used to perform a lobectomy or wedge resection without opening the chest. This thoracotomy procedure involves inserting a long, thin tube with an attached camera (thoracoscope) and small surgical instruments into the chest. Using images taken by the camera, the surgeon removes portions of the lung that contain cancerous tissue. VATS typically offers a quicker recovery time and less pain than other types of lung surgery, because no large incision

or movement of the ribs is needed. VATS also may be used to biopsy lung tissue and confirm a lung cancer diagnosis. This type of procedure is called a diagnostic thoracoscopy.

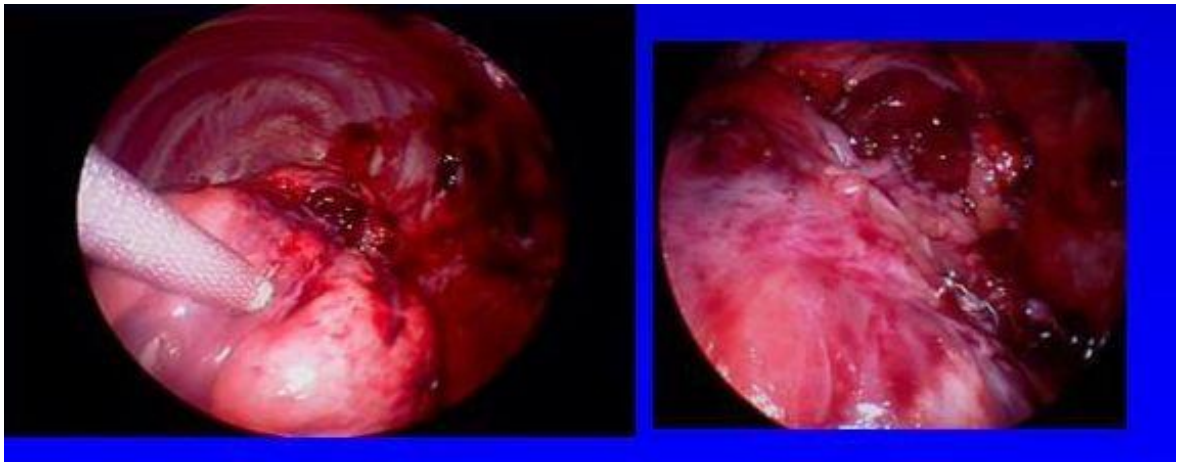

Figure 8: Video-assisted thoracic surgery (VATS)

Robotic-assisted thoracic surgery: Robotic surgery is another minimally invasive approach to treating lung cancer. The instruments have greater ranges of motion, allowing for movements that are more precise. The recovery time and pain levels are similar to those resulting from VATS.

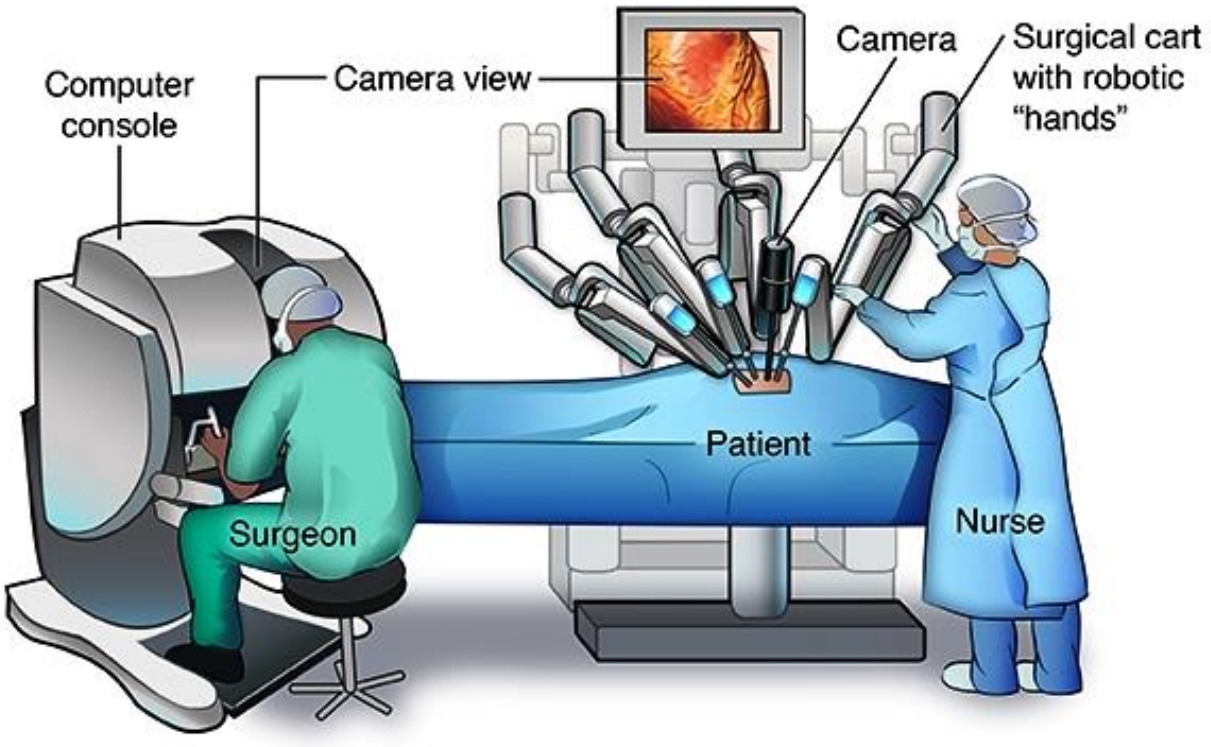

Figure 9: Robotic-assisted thoracic surgery

Wedge resection: This procedure is used to remove cancerous tissue from the lung, typically in diagnosing or treating metastasis.

Pneumonectomy: This surgery removes an entire lung.

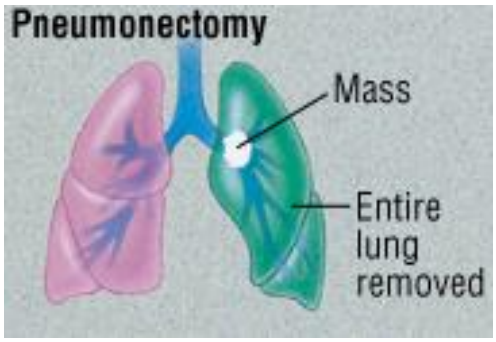

Figure 10: Pneumonectomy

Other procedures to treat lung cancer symptoms and side effects which can be caused by fluid can build up on the chest outside the lungs which press on the lungs which makes it hard to breath to treat this the surgeon numbs part of the chest and insert a hollow needle between lung and ribs to drain the fluid, Or a small opening can be made on the skin to drain using the hollow tube, adding talc and other substance inside the chest seals the space between the lungs and chest wall this helps in draining the fluid and helps in rebuilding the fluid inside the chest wall. Putting in a thin flexible tube catheter can also help to drain the fluid if formed despite the above procedure on regular basis.

Figure 11: Fluid filled outside lungs

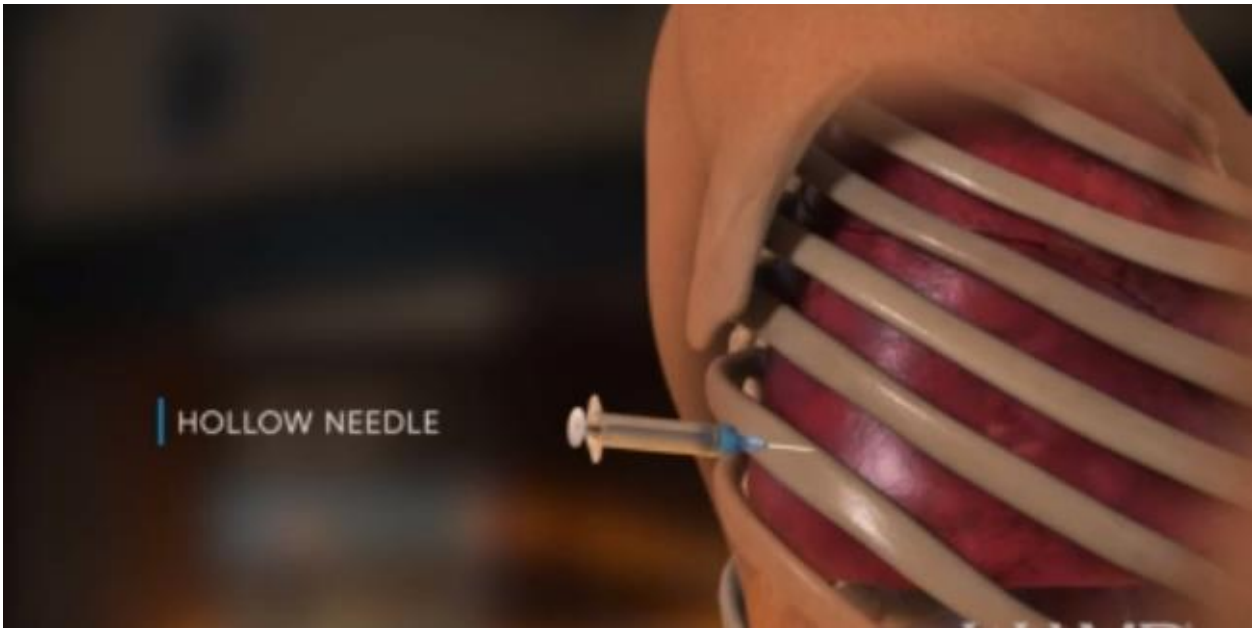

Figure 12: Use of hollow needle to drain the fluid out of lungs

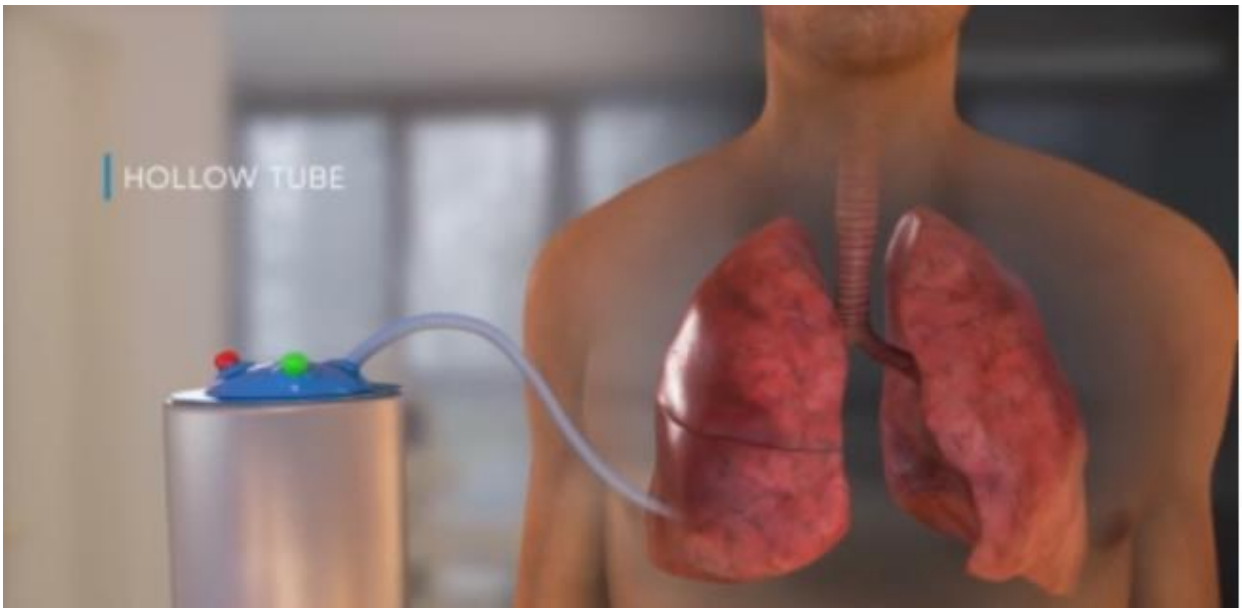

Figure 13: Drain for regular fluid removal

Figure 14: Use of Talc powder inside chest to decrease water reformation

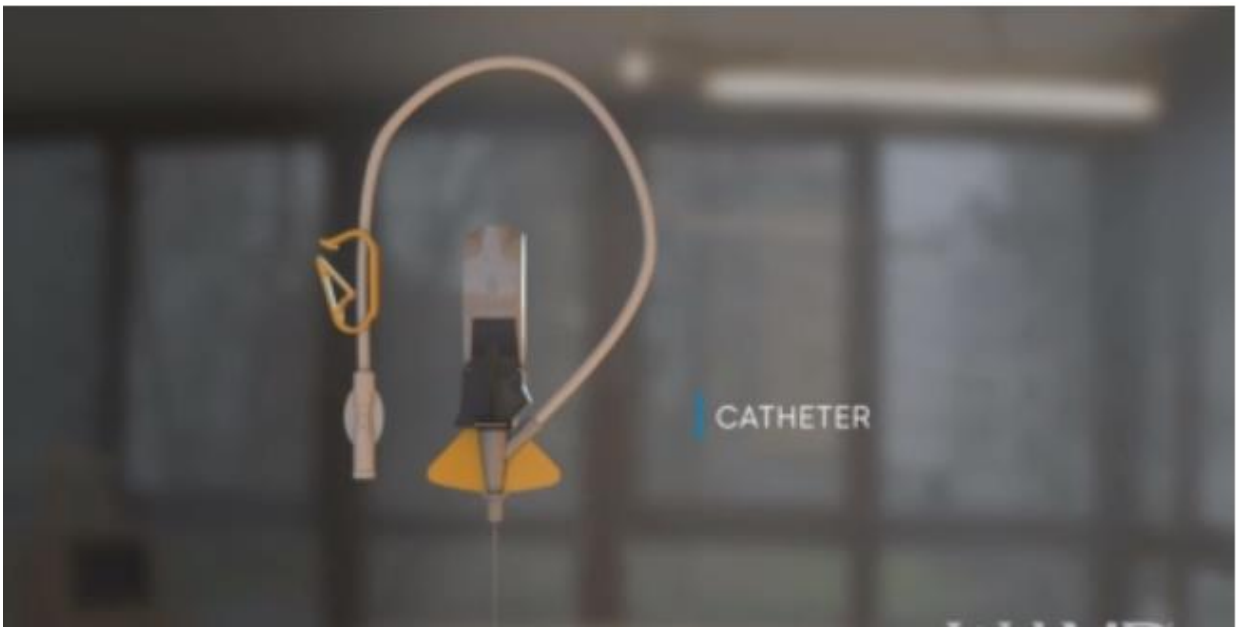

Figure 15: Cather for lung drainage

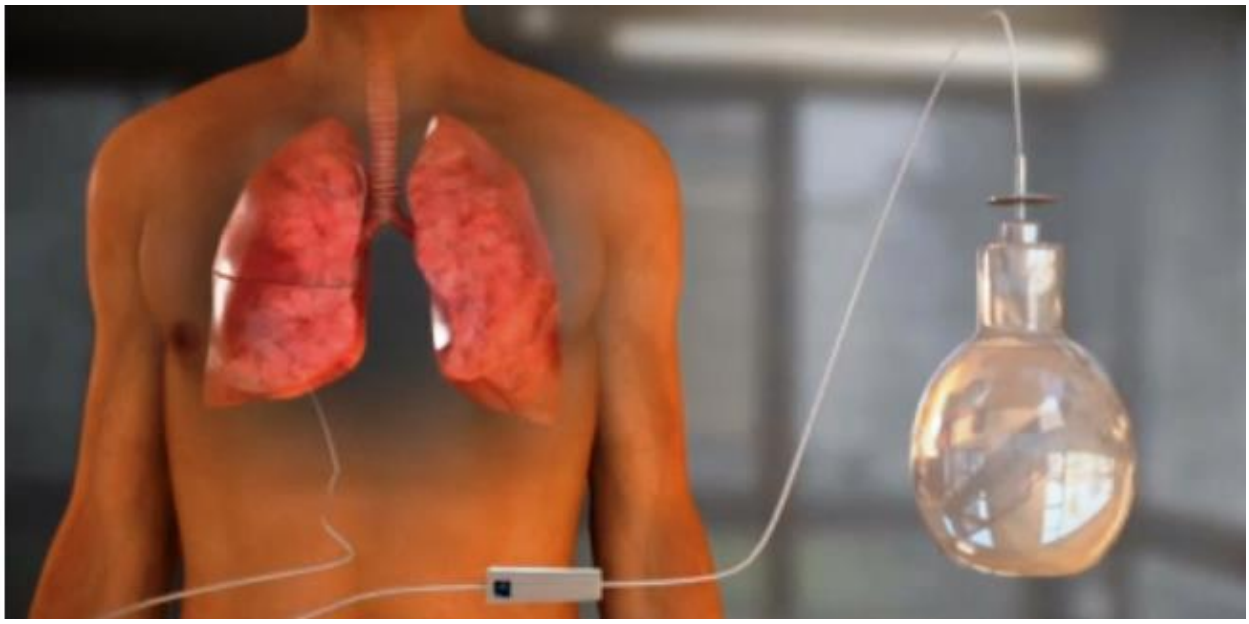

Figure 16: Drain using a Catheter

If fluid builds up around the heart preassure can keep it from working properly, to fix this surgeon can drain the fluids with a needle or he can remove a small piece of sac around the heart is taken out so that the fluids drain into the chest and belly. If the tumor is blocking an airway a metal or silicon tube can be inserted to keep the airways open.

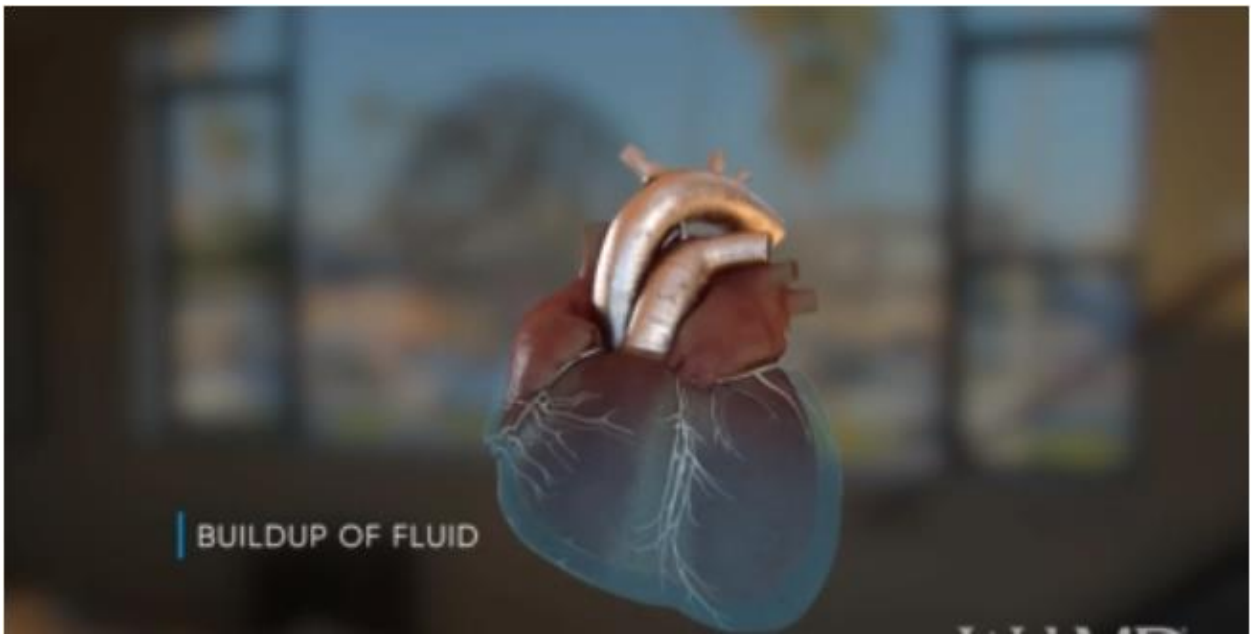

Figure 17: Buildup of fluid around heart

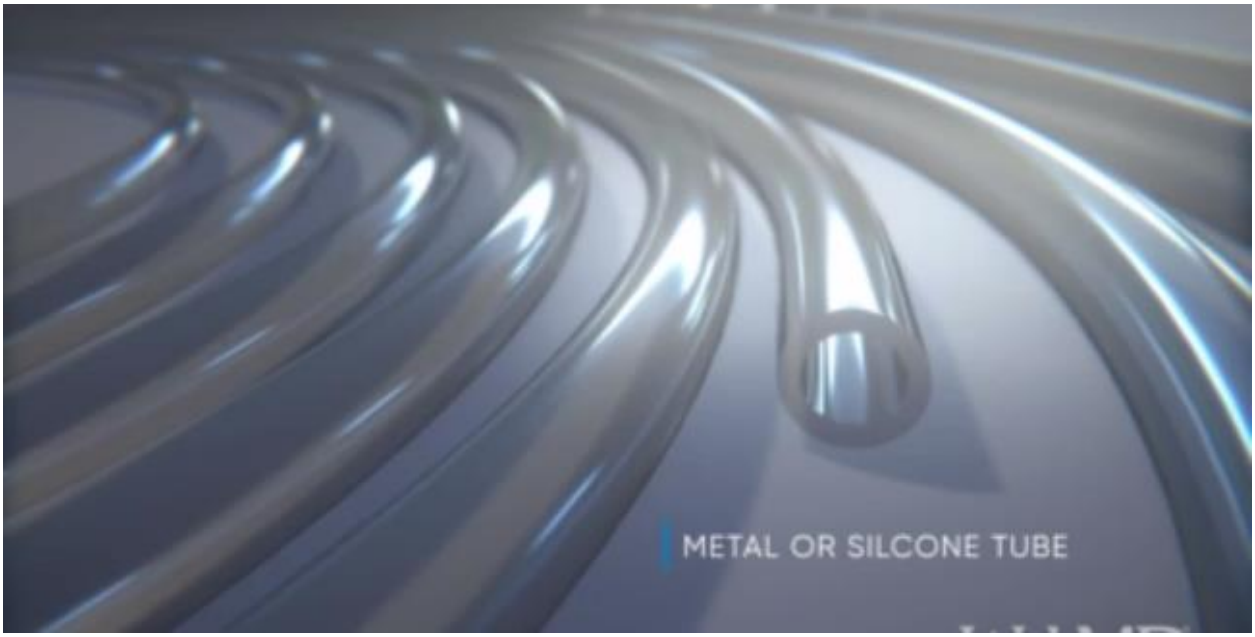

Figure 18: Metal or silicon tube for keeping functional airway

Photodynamic therapy (PDT) is another option- in this treatment a surgeon inserts a light activated drug that builds up in cancer cells and few days later a laser beam pointed at the tumor activates the drug killing the cancer cells

Figure 19: Light activated drug

Figure 20: Laser activation of light activated drug

Lasers can also be used to burn away larger tumors that are blocking the airways

DISCUSSION

In some cases, lung cancer cannot be treated when you have another medical condition such as Asthma which can make it hard to breath or make surgery too dangers. Tumor could be at a place where it can hard to be removed without harming a tissue around it. It could be close to important organs such as heart or it might have grown in other important structures such as blood vessels. Surgeon might not be able to operate as there is too much cancer spread in the lungs or it is spread outside of the lungs although the cancer may start as a single tumor cells may break off, if the cells travel through blood or lymph fluids to other parts of the body and grow more tumor can form. Lung cancer usually spreads to lymph nodes, Liver, bones, Brain and adrenal glands. If the cancer is spread and have too many tumors

Surgeon might not be able to operate. The survival statistics for stage 4 cancer are very low. For individuals with stage 4 disease, only between 2 and 13% will survive for at least five years after diagnosis.

CONCLUSIONS

Although the decrease in overall lung cancer incidence and death rates is encouraging, large state and regional differences in lung cancer trends among women underscore the need to maintain and strengthen many state tobacco control programs.

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