



Evaluations of Cardiopulmonary Problem in Cancer Patients and Involved Emboly with Clinical and Radio Ecological Points

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ABSTRACT

Introduction: In the present study, the evaluation of cardiopulmonary problems in cancer patients suffering from embolism has been investigated with clinical and radio-oncological points. Having cancer as well as its treatment can bring many complications for the patient. Cancer treatments such as radiotherapy, surgery and chemotherapy are very complicated and may have significant side effects in the short term or even after several years. People who have previously suffered from this disease and are currently treated are at a higher risk of contracting and dying from cardiovascular diseases compared to normal people in the society.

Methodology: Various studies have been conducted in this field and its various aspects have been investigated. A study published in 2021 looked at the increased risk of cardiovascular disease within 3 years of cancer patients finishing treatment. The present study investigated the issue by reviewing more than 60 articles with keywords including "Cardiopulmonary Problem", "Cancer", "Clinical and Radio Ecological Points" and "Patient".

Results: This study showed that the probability of cardiovascular disease in people with cancer was higher than in healthy people. Among the existing cancers, those who were diagnosed with bladder, kidney, prostate, colon, rectal, lung, melanoma, and testicular cancers, compared to those who were diagnosed with other cancers, had a higher probability of developing cardiovascular disease.

Conclusion: The results obtained from this study showed that in people who were between the ages of 60 and 69, the probability of developing cardiovascular disorders within 3 years after the completion of cancer treatment was 1.24 times the normal state. This study showed that people with a history of cancer have a higher chance of developing cardiovascular disease after treatment.

Introduction

Cardiac diseases include diseases that affect the cardiovascular, circulatory and circulatory system

[1-3]. In this collection, heart feeding vessel disease (coronary), heart valve disease, heart muscle disease, heart rhythm irregularity and congenital

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heart diseases are included [4-7]. Heart diseases can lead to stroke, chest pain and heart attack. With quick and early diagnosis of heart diseases, possible risks can be avoided [8-10].

Signs and symptoms of heart disease

The signs and symptoms of heart diseases may be diverse and depend on the type of disease and its severity [11-16]. Men and women with the same disease may go to the doctor with different complaints. By visiting a specialist doctor, you can diagnose your heart disease and prevent its possible complications. Below are the common signs and symptoms of heart diseases:

Symptoms of coronary artery disease: Coronary artery disease in men often presents with chest pain and in women with a feeling of pressure in the chest or shortness of breath. Pain in the middle part of the chest that spreads to the shoulder and left arm or to

the neck and back indicates a serious heart disease [17-19].

Symptoms of heart valve disease: Heart valves may lose their shape and function due to various reasons (infections, inflammatory diseases, calcium deposits due to old age), which leads to narrowing or heart valve failure [20-26]. People who suffer from heart valve disease suffer from problems such as weakness, shortness of breath, irregular heartbeat, chest pain and dizziness [27-30].

Various studies have been conducted in this field and its various aspects have been investigated. A study published in 2021 looked at the increased risk of cardiovascular disease within 3 years of cancer patients finishing treatment (Figure 1). The present study investigated the issue by reviewing more than 60 articles with keywords including "Cardiopulmonary Problem", "Cancer", "Clinical and Radio Ecological Points" and "Patient" [31-38].

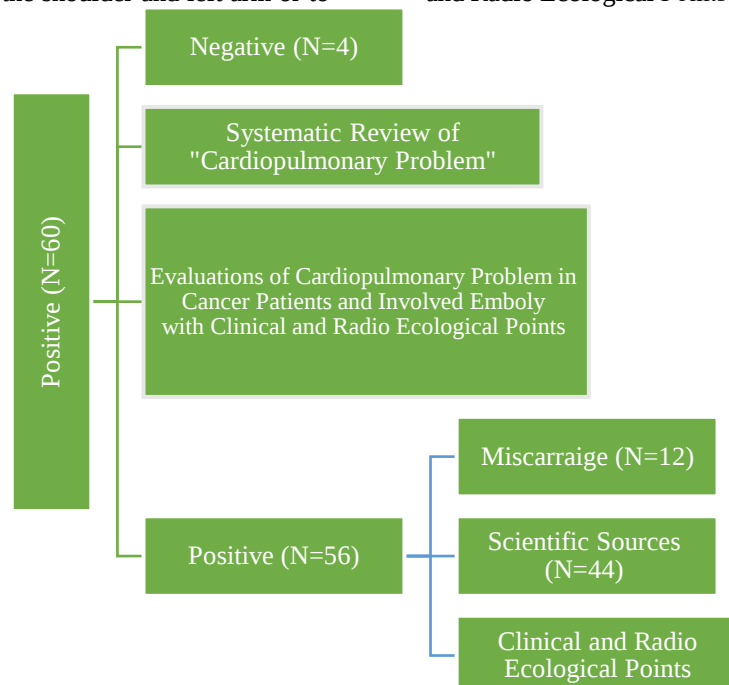


Figure 1. Flow chart of included subjects

How to diagnose heart diseases?

Usually, doctors start the diagnosis process by asking about the time, quality and how the symptoms of the disease appear during the meeting with the patient [39-45]. Heart disease is diagnosed through a series of tests and careful medical evaluations. This process includes taking a medical history, performing electrocardiography (ECG) tests to record the heart's electricity, blood tests to measure blood markers such as troponin, imaging of the heart and blood vessels using echocardiography and angiography [45-49], and in some cases equipment tests such as exercise testing or stress testing, cardiac (treadmill exercise test) to provide an accurate diagnosis [50-52].

Since the correct treatment depends on timely diagnosis, the knowledge and skill of the doctor in using the appropriate diagnostic method in the shortest possible time is very important and helps in better treatment of heart diseases and prevention of a number of their serious complications and making decisions about which tests should be performed depends on the characteristics of the disease and the condition of each patient [53-55].

Cardiopulmonary syndromes overview

Cardiopulmonary syndromes are symptoms of diseases in the heart and lungs, and among them can be respiratory discomfort (shortness of breath), cough, chest pain, irregular heartbeat and excess fluid density around the lungs - pleural effusion or

heart - pericardial Effusion - pointed out. These occur due to cancer or other conditions. Four common cardiopulmonary syndromes caused by cancer are described in this section [56-58].

Respiratory distress (shortness of breath)

- ✓ Malignant pleural effusion.
- ✓ Malignant pericardial effusion.
- ✓ Superior Vena Cava Syndrome.
- ✓ Respiratory distress and cough during advanced cancer.
- ✓ General information about respiratory distress and cough.
- ✓ Causes of respiratory distress and cough.
- ✓ Diagnosis of respiratory distress and cough [59].
- ✓ Control of respiratory distress and cough.

Respiratory distress is breathing with difficulty and pain or shortness of breath. Patients use different words such as "Chest pressure" and "Suffocating feeling" to describe the feeling of shortness of breath [60-62]. The pain caused by respiratory distress is different in each patient and varies from mild pain in one patient to severe pain in another patient. Respiratory distress is common in patients with advanced cancer and lung cancer and often occurs in the last 6 weeks of life.

Controlling the causes of respiratory distress

It is possible to diagnose and treat the causes of respiratory discomfort, and its treatment includes the following:

Treatment to shrink or remove the tumor

- ✓ **Radiation therapy:** A type of treatment in which high-energy X-rays, or other types of radiation, are used to destroy cancer cells.
- ✓ **There are two types of radiation therapy:** External beam radiation therapy, which uses a device outside the body to send radiation to the cancer. Internal radiation therapy, which places radioactive materials directly into or near the cancer site using a needle, chip, wire, or catheter.
- ✓ **Hormone therapy:** It is a type of treatment that prevents the growth of cancer cells by destroying hormones or preventing their activity. Hormones are produced by the body's glands and released into the bloodstream. Certain hormones cause certain types of cancer to grow. If tests show that cancer cells are in areas where hormones can bind to (receptors), drugs, surgery, or radiation therapy are used to reduce the production of hormones or stop them from working.
- ✓ **Chemotherapy:** It is a type of treatment in which drugs are used to stop the growth of cancer cells. This destroys cells or prevents

them from dividing. When chemotherapy is administered through ingestion or injection into a vein or muscle, the drugs can reach cancer cells throughout the body through the bloodstream: Systemic chemotherapy. When chemotherapy is given directly to the spine, an organ, or a cavity in the body, such as the abdomen, the drugs are more likely to affect cancer cells in those areas.

- ✓ **Laser therapy to remove tumors in the large airways:** Using a laser beam (a narrow beam of concentrated light) as a scalpel to remove the tumor.
- ✓ **Burning of tumors in large airways:** Using a hot tool, electric current, or caustic substance to destroy the tumor.

Stenting

If a large airway is blocked by a tumor pressing on it from the outside, a stent (thin tube) is surgically placed inside the airway to keep it open.

Medicines

- ✓ Steroid drugs to reduce inflammation and swelling of lymphatic vessels in the lungs;
- ✓ Bronchodilators, medicines that are inhaled to open the bronchioles (small air passages) in the lungs.
- ✓ Diuretics and other drugs for heart failure;
- ✓ Antibiotics to treat a chest infection; These drugs are used together with respiratory physiotherapy.
- ✓ Narcotics for moderate to severe pain relief.
- ✓ Anticoagulants, to break up blood clots that have blocked blood vessels in the lungs.
- ✓ Surgery to remove thick fluid around the lungs (see Managing Malignant Pleural Effusions), thick fluid around the heart (see Managing Malignant Pericardial Effusions), or in the abdominal cavity.
- ✓ Blood transfusion to cure anemia.

Control of symptoms of respiratory distress

Controlling symptoms of respiratory distress includes the following:

- ✓ **Oxygen therapy:** Patients who are unable to breathe enough oxygen in the air can use supplemental oxygen inhaled from tanks or cylinders. It is also recommended to use devices that absorb and concentrate oxygen in the air.
- ✓ **Drugs:** Narcotic drugs usually reduce physical pain, emotional distress and fatigue and improve the patient's quality of life. Other drugs can also be used to relieve and treat respiratory distress caused by panic disorder or severe anxiety.

General assistance: Support measures are also useful for some patients and include the following

- ✓ New breathing techniques.
- ✓ Cold air that is directed through the cheeks.
- ✓ Meditation.
- ✓ Nerve relaxation.
- ✓ Biofeedback.
- ✓ Psychotherapy.

Control of chronic cough

In some patients, chronic (long-term) cough causes pain and prevents sleeping and aggravates respiratory distress and fatigue. In the research conducted between 2019 and 2024 on 4000 patients, hospital mortality was 9.1% and in the range of 7-9%. The latest reports show that in-hospital mortality has decreased to 2-6%. The most common cause of in-hospital death in these patients was heart failure, which occurred in 55% of patients. Other risk factors for premature death include: Aging, poor left ventricular function, female sex, mitral insufficiency, cardiac arrhythmia, emergency surgery, cardiac output less than 20%, preoperative cardiac index less than 2.1l/min/ml, mean pulmonary artery pressure more than 33mmhg, serum creatinine more than 1.8 mg/dl, recent myocardial infarction and not using the internal mammary artery [63-65].

Discuss

In a study conducted by Marc-Alexander Ohlow and his colleagues in Germany in 2014 entitled Characteristics and Prognosis of Patients with Left Ventricular Aneurysm and Diverticulum, out of 26 patients diagnosed with congenital ventricular aneurysm, 61.5% had involvement in the apex area and about 45.4% in the anterior-lateral part, 7.7% in the lateral part, and one case in the septal part, and 15% of these patients had resistant recurrent tachyarrhythmia's [66-68].

In a study conducted by Abdusalam Y. Taha and his colleagues in Iraq in 2014 regarding the management of left ventricular aneurysm from 27 patients with aneurysm, the following results were obtained: The average age of the patients was 54.6 years and ECG changes such as ST elevation and Q wave was present in 8 patients (42.1%). The sensitivity and specificity of echocardiography in the diagnosis of aneurysm were 38% and 84%, respectively. 25 patients had EF lower than normal. In a study conducted by Masaru Ichida and his colleagues in 2014 in Japan on the important symptoms of left ventricular aneurysm in patients with hypertrophic cardiomyopathy and the diagnostic role of electrocardiography, the following results were obtained: Out of 247 patients with hypertrophic cardiomyopathy, 21 patients had left ventricular apical aneurysm and average the age of the patients was 60±14, and 14 patients had ST

elevation in leads V₃-V₅, and the sensitivity and specificity of ST elevation were 66.7% and 98.7%, respectively.

In a study conducted by Noboru Fujino and his colleagues in 2014 in Japan on left ventricular apical aneurysm and systolic dysfunction in hypertrophic cardiomyopathy. Out of 247 patients with hypertrophic cardiomyopathy, 21 patients had left ventricular aneurysm, out of these 21 patients, 2 patients had sudden death, 3 patients had tachycardia and ventricular fibrillation, and 5 patients had severe heart failure.

In a study conducted by Pennacchini and his colleagues in Italy in 2013, entitled ECG characteristics and clinical course of patients with hypertrophic cardiomyopathy and apical left ventricular aneurysm, out of 771 patients with cardiomyopathy, 11 patients had left ventricular aneurysm, which was average the age of the patients was 60±18. In patients with left ventricular aneurysm, two patients (18.2%) had RBBB and two patients (18.2%) had LBBB and 5 patients (83.3%) had a delay in apex opening. Also, these patients had ST segment elevation, inverted T wave, and QRS segment lengthening, and LBBB in these patients decreases the prognosis [66-68].

In a study conducted by Vladimir Shipulin and his colleagues in Russia in 2013 on the diagnosis and surgical treatment of left ventricular aneurysm with ventricular tachycardia, of the 188 patients studied who underwent surgery, the intraoperative mortality in these patients was 5% and one-year life expectancy was 92%.

In a study conducted by Hiroshi Furushima in 2012 in Japan on whether there is a stable association between ST segment elevation and abnormal Q wave as a risk factor for electric shock in patients with intraventricular defibrillators and structural heart diseases, 33 patients with ST segment elevation and Q wave, 17 patients had left ventricular aneurysm and 4 patients with coronary artery involvement did not have aneurysm while they had ST segment elevation in inferior leads and 4 patients had ST segment elevation in precordial leads and wall motion ventricle was hypokinetic.

In a study conducted by Abdolrazagh Kiani and his colleagues in 2011 on the relationship between coronary artery aneurysm and QT segment widening in the acute phase of Kawasaki disease on 65 patients in Iran, the results are as follows: QT segment sensitivity in patients with 100% severe coronary artery involvement, 93.4% specificity, 50% false positive value, 100% false negative value, and 93.8% accuracy.

In a study conducted by Onur Sinan Devenci and his colleagues in 2010 on evaluating the relationship between atrial wall aneurysms and ventricular arrhythmias by determining P wave broadening and P wave duration on 66 patients in New York City, the results are as follows: The study group included

66 patients with atrial wall aneurysm and the control group included 62 healthy patients. Supraventricular arrhythmias were seen in 29 patients with atrial wall aneurysm and 5 patients in the control group. The average P wave expansion in patients with atrial wall aneurysm was significantly longer than the control group, and the average P wave duration in the study group was longer than the control group.

In a study conducted by Ohlow MA and his colleagues in 2009 on the prevalence of abnormal electrocardiography in patients with congenital left ventricular aneurysm or diverticulum on 125 patients in Germany, the results are as follows: Out of 125 patients, 54 patients had a normal ECG and 71 patients had abnormal ECG. Also, in this study, the prevalence of abnormal ECG in these patients is more than 56.8%, and ECG has low sensitivity and specificity for screening.

In a study by Anton P.M. Gorges in 2009 entitled "Is ECG valuable in congenital left ventricular aneurysm and diverticulum" on 125 patients with congenital left ventricular aneurysm and diverticulum. The average age of the patients was 66 years. 56.8% of patients had abnormal ECG changes, especially inverted T wave more than 2 mm in 2 leads, abnormal Q wave, RBBB, prolongation of PR interval and atrial fibrillation.

In a study conducted by Xia S and colleagues in 2009 in America on 6 patients. 5 patients have a posterior basal aneurysm and one patient has an anterolateral aneurysm. 2 patients had abnormal Q and none of the patients had ST elevation in ECG and all patients had severe ventricular arrhythmias.

In a study conducted by Ohlow M.A. and his colleagues in 2008 on the prevalence and results of congenital left ventricular aneurysm and diverticulum in the adult population of 12,271 patients who underwent angiography, the following results were obtained: Prevalence of congenital aneurysm and diverticulum in 94 patients (76%) Of these, 42 patients (34%) had congenital left ventricular aneurysm and 52 patients (42%) had diverticula. Its mortality rate was 6% without cardiac arrest, and patients with diverticula had more frequent embolism. The rate of syncope was the same between the two groups, and none of the patients suffered heart rupture.

In a study conducted by Borges Periraj and his colleagues in 2007 on the prevalence of left ventricular aneurysm among patients with chronic Chagas in two regions in Brazil, the results as

follows: Out of 261 patients, 23 patients had 17 patients had aneurysms in the anterior part, 4 patients in the posterior wall, one patient in the lower wall, one patient in the interventricular wall.

In a study conducted by ChattaV. R. Reddy and his colleagues in 2006 on the investigation of the broken part of the QRS in the left leads in the absence of bundle branch block as a sign of left ventricular aneurysm on 110 patients at Methodist Hospital in New York City, the results as follows: 55 patients with left ventricular aneurysm had QRS segment fracture and 5 patients had both QRS segment fracture and ST elevation in leads V₁-V₃. The sensitivity of QRS fragment to identify left ventricular aneurysm was reported to be 50%, its specificity was 94.6%, the false positive value was 83.3%, and the false negative value was 79.2%.

In a study by John E. Madias et al in 2005 on the diagnosis of ventricular aneurysm and other severe left ventricular disorders following myocardial infarction in the presence of right bundle branch block: The diagnostic relevance of electrocardiogram through electrocardiography or contrast ventriculography on 175 right bundle branch block was performed on 28 patients with left ventricular aneurysm, the results of which are as follows: Out of 28 patients with left ventricular aneurysm, 21 patients had ST elevation of more than 1 mm in leads (V₁-V₃) and 21 out of 28 patients had Q wave in leads (V₂-V₃). They reported the sensitivity of ST elevation to be 75% and its specificity to be 93%.

In a study conducted by Smith SW in 2005 in the United States, the ratio of the T wave to the QRS segment was the best diagnostic tool for ventricular aneurysm from anterior myocardial infarction. The best diagnostic criterion is the ratio of total T wave to total QRS wave from V₁ to V₄, which was present in 4 out of 59 patients (Table 1).

In a study conducted by Perek B. and his colleagues in 2004 in Poland on the clinical profile and the result of surgical treatment of left ventricular pseudo aneurysm caused by previous chronic infarction on 8 patients, the following results were obtained: The average age of the patients was 55.9 years. 50% of patients with CHF, 2 patients with unstable angina pectoris, 6 patients with abnormal ECG such as myocardial infarction and continuous ST elevation in chest X-ray, 5 patients with cardiomegaly and 2 patients with pulmonary edema [68].

Table 1. Forest plot showed the Evaluations of Cardiopulmonary Problem in Cancer Patients and Involved Emboly with Clinical and Radio Ecological Points

Raw	Study	Year		Proportion	Wight 98%	Weight %
1	Abdollahi et al.	2014		0.68	[0.42 - 1.06]	3.12
2	Aldulaim et al.	2022		0.74	[0.41 - 1.08]	2.12
3	Aldulaimi et al	2022		0.89	[0.29 - 1.01]	1.25
Heterogeneity $t^2=0.00$, $I^2= 0.02$, $H^2=1.01$				0.98	[0.20 - 1.06]	-
Test of $\Theta= \Theta$, $Q (4) =4.00$, $P= 0.71$			-			
1	Beiranvandi et al.	2022		0.92	[0.39 - 1.06]	3.23
2	Danesh et al.	2022		0.87	[0.54 - 1.02]	1.22
3	Eskandar et al.	2020		0.88	[0.23 - 0.41]	1.27
Heterogeneity $t^2=0.02$, $I^2= 0.03$, $H^2=1.02$				0.95	[0.23 - 1.06]	-
Test of $\Theta= \Theta$, $Q (4) =2.09$, $P= 0.74$			-			
1	Ansari et al.	2022		0.84	[0.27 - 1.08]	1.38
2	Baghestani et al.	2018		0.76	[0.26 - 1.06]	2.22
3	Bauer et al.	2022		0.69	[0.28 - 1.05]	3.35
Heterogeneity $t^2=0.01$, $I^2= 0.04$, $H^2=1.03$				0.0.95	[0.26 - 1.05]	-
Test of $\Theta= \Theta$, $Q (4) =4.09$, $P= 0.40$			-			

Conclusion

This study showed that the probability of cardiovascular disease in people with cancer was higher than in healthy people. Among the existing cancers, those who were diagnosed with bladder, kidney, prostate, colon, rectal, lung, melanoma, and testicular cancers, compared to those who were diagnosed with other cancers, had a higher probability of developing cardiovascular disease. Also, this study stated that age is also effective in the results obtained. For example, the analysis of the results obtained from this study showed that in people who were between the ages of 60 and 69, the probability of suffering from cardiovascular disorders within 10 years after the completion of cancer treatment was 1.24 times the normal state. Of course, it should be noted that this relationship was not observed with other age groups. This study showed that people who had a previous history of cancer had a higher probability of developing cardiovascular disease 10 years after the end of treatment. Therefore, it is recommended that these patients are routinely visited by a cardiologist and their cardiovascular conditions are monitored. It should be noted that suffering from heart diseases in these patients can greatly reduce their quality of life and life expectancy.

Researchers analyzed the health data of more than one million men and found that the better the heart and lung health, the lower the risk of developing nine types of cancer. According to researchers, physical fitness, especially in the cardiorespiratory

system, may reduce the risk of nine different types of cancer by 40%. These nine cancers are: Head and neck, stomach, pancreas, liver, colon, rectum, esophagus, kidney and lung. "It is known that exercise and physical activity help reduce the overall risk of cancer, but less is known about cardiorespiratory fitness and its relationship with specific types of cancer," said lead author Dr. Aron Anrup from the University of Gothenburg, Sweden. The study unequivocally concludes that a higher level of cardiovascular fitness provides protection against nine different types of cancer. Researchers conducted a large observational study using a Swedish database to examine the health and fitness information of more than one million male soldiers. They then tracked cancer outcomes over the next three decades, with an average observation period of 33 years. The study included men who had been conscripted from 1968 to 2005. The conscripts were subjected to standard physical assessments including blood pressure, BMI, height and weight, and physical strength. In the new study, researchers used individual performance on the VO_2 test to establish criteria for three levels of cardiorespiratory fitness: Low, moderate, and high. The researchers observed that compared to men who had the lowest level of cardiorespiratory fitness, men who had the highest level of physical fitness had the lowest risk of head and neck, stomach, pancreas, liver, colon, rectum, esophagus, kidney, and lung cancer were facing.

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Conflicts of interest

The authors declare that they have no competing interests.

Disclosure Statement

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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