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THE ROLE OF CARDIOVASCULAR IMAGING AND SERUM BIOMARKERS IN IDENTIFYING EARLY CARDIO TOXICITY RELATED TO CANCER THERAPY: NOVEL APPROACH

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I. ABSTRACT: Cancer therapy-related cardiac dysfunction (CTRCD) is one of the side effects that nearly one tenth of cancer patients experience. LVEF and GLS have been suggested as markers for CTRCD prediction. The timing of when strain imaging should be used to evaluate CTRCD following chemotherapy is still under investigation, but recent studies also suggest assessing cardiac biomarkers like troponin for the early detection of CTRCD.

objective: The goal of this study was to find out how well echocardiography can detect CTRCD, how it relates to troponin I, and how well strain imaging can predict CTRCD one week after chemotherapy treatment.

Methodology: 100 cancer patients with and without anthracycline therapy were selected for a prospective observational study from March 2019 to April 2020. Echocardiographic parameters such as LV function, GLS, GCS, and blood troponin I were evaluated prior to and one week after the start of the chemotherapeutic treatment, respectively. We used a reference range below -18 for GLS and -22 for GCS in our study to indicate significantly decreased strain.

Results: Twenty-two of the 100 patients developed CTRCD. Patients who developed CTRCD had lower GLS, lower LVEF, and significantly higher troponin I levels following chemotherapeutic treatment than patients who did not develop CTRCD. GLS was strongly associated with EF in CTRCD patients (2=35.06, p 0.001) Additionally, decreased EF and GLS were significantly correlated with elevated troponin (2=31.31, p 0.001) and 78.95, respectively.

Conclusion: CTRCD was linked to an increase in troponin I in a mixed cancer population. In order to predict CTRCD, the study proposes performing early strain imaging within a week of chemotherapeutic treatment. Increased troponin I was found to be significantly correlated with a decrease in strain (GLS). Early detection leads to the diagnosis of subclinical cardiac dysfunction, which improves the risk stratification of patients for chemotherapy, and treatment improves quality of life. To support the findings of this study, larger prospective studies focusing on a single type of cancer population are required

Keywords Cancer, CTRCD, GLS, LVEF, troponin, biomarkers etc.

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Introduction:

Cardiotoxicity, particularly cancer therapeutics–related cardiac dysfunction (CTRCD), which is a major contributor to morbidity and mortality, is one of the long-term effects of cancer treatment on cancer survivors (Miller et al., 2022). CTRCD is defined by a number of different parameters and has multiple definitions. According to the European Task Force, the American Society for Echocardiography, the European Association of Cardiovascular Imaging, and the European Task Force, CTRCD is defined as a decrease in left-ventricular ejection fraction (LVEF) of more than 10% to less than 53% (LVEF - the lower limit of normality), with a repeat procedure performed two to three weeks after the initial decrease (**Manrique et al., 2017, p3).**

Additionally, subclinical left ventricular (LV) dysfunction and subsequent CTRCD are linked to abnormal echo parameters like a relative decrease of more than 15% in left ventricular global longitudinal strain (GLS) compared to baseline strain (Oikonomou et al., 2019). In addition, the severity of CTRCD can range from direct, dose-dependent irreversible myocardial damage (Type 1) to dose-independent, dose-independent reversible myocardial damage (Type 2), as well as indirect effects like arrhythmias and hypertension in response to certain drugs (Type 5) (Perez et al., 2019). Anthracycline and trastuzumab, two different chemotherapeutic agents, are strongly linked to CTRCD. CRTCD can range from an asymptomatic drop in left ventricular ejection fraction (LVEF) to thrombotic events, cardiovascular ischemia, and overt heart failure, depending on the chemotherapeutic agent (**Yeh & Bickford, 2009).**

The standard screening procedure and the foundation for the evaluation of CTRCD is the noninvasive detection of deteriorating LVEF using imaging techniques like echocardiography (Manrique et al., 2017). However, imaging modalities have become less viable due to a number of factors, including image heterogeneity, contradictory findings, radiation use, high costs, and limited availability. Additionally, when there is severe and irreversible myocardial damage, which may be too late to initiate the necessary cardioprotective interventions, researchers believe that detection using imaging modalities is more likely. Researchers are looking for newer techniques like strain imaging and serum biomarkers that can act as an indicator of cardiac toxicity because, in some instances, the early stages of CTRCD reduction in LVEF are not very evident due to myocardial compensation (**Manrique et al., 2017).**

Recent research (**Thavendiranathan et al.,)** shows that strain imaging, like STE, is more sensitive than echocardiography at detecting subtle damages to the myocardial ultrastructure. 2014). In this setting, it is widely acknowledged that the left-ventricular global longitudinal strain (GLS), which can be used to detect LV dysfunction and adverse cardiac events, has prognostic value (Kalam et al., 2014). As per the most recent rules, a 12% relative decline or a ≥5% outright diminishing in GLS with typical LVEF has a decent prognostic capacity to recognize CTRCD (**Curigliano et al., 2021).**

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In clinical settings, the absolute change in GLS is typically evaluated between 1.5 and 6 months following the beginning of chemotherapy (Oikonomou et al., 2019). To predict a high risk of CTRCD, a meta-analysis found GLS values ranging from 21.0% to 13.8%; however, the author also suggests that this analysis is limited for a variety of reasons, including the type of cancer, clinical heterogeneity, treatment regimen, and small prospective, single-center studies (**Oikonomou et al., 2019).**

To detect CTRCD, integration of cardiac biomarkers like classical troponin and natriuretic peptides (NPs) with newer biomarkers like MPO, GDF-15, and CRP has been going on (Xiao et al., 2021). Troponin I is the most sensitive and cardiac-specific biochemical marker for the prediction of CTRCD among these CTRCD biomarkers (Xiao et al., 2021). Both cardiac troponin T (cTnT) and cardiac troponin I (cTnI) are expressed in the myocardium and play a role in controlling the contraction of cardiac muscle thin filament and skeletal muscle.

Echocardiographic changes are preceded by cardiac troponin release following heart injury like myocardial infarction (Xiao et al., Xiao et al. (2000) found that elevated troponin is a sign of subclinical functional and myocardial damage. 2021). Zhang et al. say that, 2022), the start of chemotherapy causes myocardial damage to release troponin, which then causes a decrease in GLS, the progression of asymptomatic cardiotoxic, a decrease in LVEF, and eventually the onset of HF symptoms. CTRCD has been defined in some studies by elevated cardiac markers like troponin I detection. A troponin test does not require any special expertise, is highly reliable, and is less expensive than an echocardiogram. The recent troponin assay kit can detect low levels of troponin with high precision, and there is a minimal release of troponin as a result of anthracycline cardiotoxicity.

As a result, the significance of troponin as a biomarker has increased significantly (Smith et al., 2010; Zhang and others, 2022). Patients taking anthracycline frequently experience dynamic changes in high-sensitivity (hs)-cTnI (Pudil et al., 2020). Similar to this, (Torres et al., 2020) used ROC analysis to demonstrate that an elevated troponin level is a specific and sensitive marker for CTRCD identification. According to Kitayama et al., in response to chemotherapy, 2017) found that patients who developed cardiotoxicity from epirubicin and trastuzumab had higher concentrations of hs-cTnT. Ponde et al., on the other hand, After two weeks of treatment with trastuzumab or lapatinib, no single measurement of hs-cTnT was found to be significantly predictive of cardiac adverse events in cancer patients (2019).

Cardiotoxicity is one of the side effects of chemotherapy that shows up within a year of starting treatment. The decline in left ventricular ejection fraction (LVEF) is a sign of cardiotoxicity, subsequent CTRCD, and mortality, regardless of the type of cancer and the treatment regimen. However, even after being diagnosed with CTRCD, the majority of patients do not exhibit any symptoms.

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As a result, CTRCD needs to be diagnosed early so that preventative measures can be taken before LVEF declines. Therefore, the purpose of this study is to determine the predictive value of troponin I in CTRCD within a week of receiving chemotherapy and to assess the efficacy of echocardiography in the detection of CTRCD.

II. Methods:

Study population:

The Department of Cardiology at KLES Dr. Prabhakar Kore Hospital and Medical Research Center conducted this prospective observational study. Belgaum, which took place over the course of a single year, from March 2019 to April 2020. The participants in this study were 100 adult patients between the ages of 16 and 80 who were undergoing chemotherapy with anthracyclines and non-anthracycline based agents (alkylators, antimetabolites, tubulin active agents targeted therapies) and who were willing to give informed consent. They had been diagnosed with cancers such as breast carcinoma (n = 52), ovarian cancer (n = 10), and other types of cancer (n = 38). Other cardiomyopathies-related conditions, such as hypertension, valvular heart disease, kidney disease, and chronic liver disease, were excluded from the study.

Prior to beginning the study, the Ethical and **Research Committee of Jawaharlal Nehru Medical College, Belgaum was contacted for approval.**

Laboratory methods for ECG and troponin I

Detailed clinical data such as history of diseases and risk factors were collected from patients' medical records. The patients were subjected to multiple tests including blood investigation, ECG and 2DE before and after the chemotherapy.

Troponin I measurement

To test Troponin, I, blood samples (2cc) were drawn into a plain bulb under aseptic conditions. Troponin I was measured using the Troponin I Card test kitGetein (Getein Biotech, Inc.) before and one week after the chemotherapeutic treatment.

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Echocardiographic evaluation

PHILIPS EPIC -7C cardiac ultrasound was used for echocardiography to measure cardiac function. Systolic capability was surveyed utilizing visual examination and Bi plane Simpson's technique and drop of LVEF to <54 % was viewed as unusual. The grades of diastolic dysfunction ranged from one to four. E/Aratio less than 1.0 and DT greater than 200 milliseconds are considered to be in the first grade; E/Aratio greater than 2.0 and DT less than 160 milliseconds are considered to be in the third and fourth grades. For longitudinal strain, loops from the Apical 4 chamber, the Apical 3 chamber, and the Apical 2 chamber were acquired. For circumferential strain, loops from the Apex, the mitral valve level, and the basal level were acquired. End myocardial borders were precisely marked for strain measurement, and then analysis was carried out. Using sex-, age-, and vendor-specific strain values found in a normative population, a significant decline in global longitudinal (GLS) and circumferential (GCS) strain is defined as >2 standard deviations below the mean. A reference range below -18 for GLS and -22 for GCS was considered a significantly reduced post-chemotherapy strain in our study.

Biomarkers

Testing with cardiac biomarkers is a highly sensitive, widely available, and relatively cost-effective method of testing for myocardial injury among patients undergoing chemotherapy.28 The following describes the biomarkers used to detect cardiotoxicity.

Statistical analysis

SPSS version 24.0 was utilized for the statistical analysis of the collected data. The Shapiro-Wilk test was used to look for normality in the continuous variables, which were shown as mean minus standard deviation (SD). The Chi-square or Fisher's exact tests were used to compare categorical variables, while Mann-Whitney U tests were used to compare continuous variables that did not have a normal distribution. A statistically significant rob ability value (p) of less than 0.05 was considered

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Result analysis:

Baseline characteristics based on CTRCD

Table 1 provides a summary of baseline characteristics based on the presence or absence of CTRCD. In the current review, CTRCD was characterized in light of removed values underneath - 18 for GLS and -22 for GCS. Out of 100 patients, 22 were guys and 78 were females with a mean time of 52.7 ± 13.0 years. CTRCD affected 22 cancer patients in total. It was found that CTRCD was correlated with certain characteristics at the beginning. There was a significant association between CTRCD and age (p = 0.05), hypertension (p = 0.001), diabetes mellitus (p = 0.05), ECG findings (p = 34.37), pre other 2D findings (p = 0.05), post other 2D findings (p = 23.17), post troponin (p = 78.95), pre strain (p = 0.01), and post strain (p = 89.31). Other variables, such as gender, smoking, tobacco use, pre- and post-diastolic function, cancer types, and chemotherapy type, had no statistically significant associations.

Table 1: Association of chemotherapy-related cardiac dysfunction (CTRCD) with demographics and co-morbidities

Variables	Categories	Chemotherapy-related cardiac dysfunction (CTRCD)		Total	Chi- Square
		Absent	Present		
Sex	Male	17 (21.8%)	5 (22.7%)	22	0.009
	Female	61 (78.2%)	17 (77.3%)	78	
Age (years)	<18	1 (1.3%)	0 (0%)	1	14.849*
	18-30	4 (5.1%)	0 (0%)	4	
	31-40	9 (11.5%)	1 (4.5%)	10	
	41-50	28 (35.9%)	2 (9.1%)	30	
	51-60	18 (23.1%)	6 (27.3%)	24	
	61-70	17 (21.8%)	11 (50%)	28	
	71-80	1 (1.3%)	2 (9.1%)	3	
Hypertension	Absent	65 (83.3%)	10 (45.5%)	75	13.131***
	Present	13 (16.7%)	12 (54.5%)	25	
Diabetes mellitus	Absent	74 (94.9%)	18 (81.8%)	92	3.973*
	Present	4 (5.1%)	4 (18.2%)	8	
Smoking	Absent	70 (90.9%)	20 (90.9%)	90	0.000
	Present	7 (9.1%)	2 (9.1%)	9	
Tobacco consumption	Absent	68 (87.2%)	18 (81.8%)	86	0.410
	Present	10 (12.8%)	4 (18.2%)	14	
Types of cancer	Ca Breast	43 (55.1%)	9 (40.9%)	52	2.168
	Ca Ovary	6 (7.7%)	4 (18.2%)	10	
	Others	29 (37.2%)	9 (40.9%)	38	
ECG findings	LVH	2 (2.6%)	5 (22.7%)	7	34.371***
	LVH, Str	1 (1.3%)	0 (0%)	1	
	Old AWMI	0 (0%)	1 (4.5%)	1	
	Old IWMI	0 (0%)	1 (4.5%)	1	
	Sinus tachycardia	2 (2.6%)	4 (18.2%)	6	

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Variables	Categories	Chemotherapy-related cardiac dysfunction (CTRCD)		Total	Chi- Square
	Tachycardia	1 (1.3%)	1 (4.5%)	2	
	Within normal limits	72 (92.3%)	9 (40.9%)	81	
	WNL, Tach	0 (0%)	1 (4.5%)	1	
Type of chemotherapy	Anthracyclines	44 (56.4%)	9 (40.9%)	53	1.655
	Non-Anthracyclines	34 (43.6%)	13 (59.1%)	47	
Pre other 2D echo findings	Negative	74 (94.9%)	18 (81.8%)	92	3.973*
	Positive	4 (5.1%)	4 (18.2%)	8	
Post other 2D echo findings	Negative	74 (94.9%)	12 (54.5%)	86	23.178***
	Positive	4 (5.1%)	10 (45.5%)	14	
Pre troponin I	Negative	78 (100.0%)	22 (100.0%)	100	
Post troponin I	Negative	75 (96.2%)	1 (4.5%)	76	78.952***
	Positive	3 (3.8%)	21 (95.5%)	24	
Pre strain	Normal	78 (100.0%)	20 (90.9%)	98	7.236**
	G1	0 (0%)	2 (9.1%)	2	
Post strain	Normal	76 (97.4%)	0 (0%)	78	89.316***
	Positive	2 (2.6%)	22 (100%)	22	
Pre diastolic dysfunction	Normal	12 (15.4%)	0 (0%)	12	3.846
	G1	66 (84.6%)	22 (100%)	88	
Post diastolic dysfunction	Normal	8 (10.3%)	0 (0%)	8	2.453
	G1	70 (89.7%)	22 (100%)	92	

1.1 Differences in clinical and echocardiographic parameters based on CTRCD

Table 2 displays the age, systolic and diastolic blood pressure, and pre- and post-treatment ejection fraction differences between CTRCD and non-CTRCD patients. Age (Z = -3.29, p 0.05), systolic blood pressure (Z = -3.05, p 0.05), diastolic blood pressure (Z = -2.17, p 0.05), pre-ejection factor (Z = -2.68, p 0.05), and post-test ejection factor (Z = -5.88, p 0.05) were statistically significant in patients with and without When compared to the respective variables in the non-CTRCD group, CTRCD patients had a significantly higher mean age of 61.05 9.8 years, high systolic blood pressure of 133.0 20.59 mmHg, high diastolic blood pressure of 80.82 8.98 mmHg, and reduced post ejection fraction of 53.02 8.5%.

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Table 2: Difference in age, blood pressure and ejection fraction based on CTRCD

Variables	CTRCD	Mean ±SD	N	Mean Rank	Mann-Whitney U	Z value
Age (years)	Absent	50.81±12.53	78	45.44	**463.50**	**-3.288****
	Present	61.05±9.85	22	68.43		
Systolic blood pressure (mm Hg)	Absent	118.95±13.57	78	45.84	494.50	-3.045**
	Present	133±20.59	22	67.02		
Diastolic blood pressure (mm Hg)	Absent	76.21±6.84	78	47.21	601.50	-2.169*
	Present	80.82±8.98	22	62.16		
Pre Ejection fraction (%)	Absent	60.00±0.00	78	51.50	780.00	-2.676**
	Present	58.86±3.76	22	46.95		
Post ejection fraction (%)	Absent	60.00±0.00	78	55.00	507.00	-5.884***
	Present	**53.02±8.85**	**22**	**34.55**		

***p<0.05; **p<0.01; ***p<0.001**

Table 3 displays the distinction between CTRCD and non-CTRCD patients' pre- and post-treatment GCS and GLS. The differences in pre-global circumferential strain (Z = -2.49, p 0.05), post-global circumferential strain (Z = -6.82, p 0.05), and post-global longitudinal strain (Z = -7.20, p 0.05) were found to be significant in patients with and without CTRCD. When compared to the respective variables in the non-CTRCD group, CTRCD patients had a significantly reduced post GCS of -17.00 3.28% and a significantly reduced post GLS of -14.41 2.72%.

Table 3: Difference in fraction global circumferential strain and global longitudinal strain based on CTRCD

Variables	CTRCD	Mean±SD	N	Mean Rank	Mann-Whitney U	Z value
Pre global circumferential strain	Absent	-27.61±6.78	78	46.78	567.50	-2.489*
	Present	-26.64±2.04	22	63.70		
Post global circumferential strain	Absent	-24.08±2.89	78	40.08	45.00	-6.815***
	Present	-17.00±3.28	22	87.45		
Pre global longitudinal strain	Absent	-24.96±2.93	78	48.26	683.50	-1.470
	Present	-23.77±2.16	22	58.43		
Post global longitudinal strain	Absent	-21.81±2.64	78	39.50	0.00	-7.198***
	Present	-14.41±2.72	22	89.50		

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1.2 Association of GLS with post ejection fraction and patient's age

Table 4 shows that post-GLS was statistically associated with post ejection fraction (2=35.06, p 0.001) and age (2=14.84, p 0.05). Nine patients (40.9 percent) with a post-GLS value below -18 were considered to have reduced strain and a post-ejection fraction below 60%, while 78 patients (100 percent) with a post-GLS value above -18% had normal strain and LVEF (>60%). LVEF was maintained in 59.1% of CTRCD patients despite a decrease in GLS. According to the data, not all of the CTRCD patients met the requirements of having low LVEF and reduced GLS. Additionally, the frequency of CTRCD cases with reduced post-GLS increased with age, reaching >50 years, indicating an increased risk factor for older age.

Table 4 : Association ofpost-GLS with post ejection fraction and age

		Post global longitudinal strain		Total	Chi-square
		> -18	**≤ -18**		
Post ejection fraction (%)	<60	0 (0%)	9 (40.9%)	9	35.065***
	≥60	**78 (100%)**	**13 (59.1%)**	**91**	**14.849***
Age	**<18**	**1 (1.3%)**	**0 (0%)**	**1**	
	18-30	**4 (5.1%)**	**0 (0%)**	**4**	
	31-40	**9 (11.5%)**	**1 (4.5%)**	**10**	
	41-50	**28 (35.9%)**	**2 (9.1%)**	**30**	
	51-60	**18 (23.1%)**	**6 (27.3%)**	**24**	
	61-70	**17 (21.8%)**	**11 (50%)**	**28**	
	71-80	**1 (1.3%)**	**2 (9.1%)**	**3**	

*****p<0.001**

1.3 Association of echocardiographic parameters with Troponin I

Regarding the association between echocardiographic parameters and troponin I values, the post ejection fraction (χ^2=31.31, p < 0.001) and post GLS (χ^2=78.95, p < 0.001) were significantly associated with troponin I values (Table 5). Out of 22 CTRCD patients with reduced post GLS (≤ -18%), 21 patients had positive troponin values. Further, all 9 patients with reduced LVEF (<60%) also had positive troponin values. It can be inferred that post chemotherapy decreased GLS can effectively predict CTRCD and it can be correlated with positive Troponin-I.

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Table 5: Association of ejection fraction and global longitudinal strain with troponin I.

		Post troponin I		Total	Chi-square
		Negative	Positive		
Post ejection fraction (%)	**<60**	**0 (0.0%)**	**9 (37.5%)**	**9**	31.319**
	≥60	**76 (100.0%)**	**15 (62.5%)**	**91**	
Post global longitudinal strain	**> -18**	**75 (98.7%)**	**3 (12.5%)**	**78**	78.952**
	≤ -18	**1 (1.3%)**	**21 (87.5%)**	**22**	

****p=0.000**

Discussion:

We characterized the rise in troponin I within a week of chemotherapy treatment in various CTRCD-positive cancer populations in this prospective, single-center study. This study's main findings are (i) a significant association between GLS and EF in CTRCD patients; and (ii) a significant correlation between lower EF and lower GLS when troponin is positive. Our study's findings emphasize the importance of evaluating Troponin-I GLS as soon as possible after chemotherapy to predict CTCD.

In the analysis of patient-related risk factors, hypertension significantly increased the likelihood of CTRCD. This was like other announcing wherein chemotherapy-treated patients with hypertension showed higher commonness of CTRCD and this was related with LV brokenness or left ventricular hypertrophy post chemotherapy in hypertensive patients (Tanaka et al., 2021).

Additionally, CTRCD was more common in cancer patients who were older (Table 1). Esteban-Fernández et al. support this by saying, 2021) identifies older age as an additional CTRCD risk factor. Additionally, the findings regarding diabetes mellitus support previous findings regarding diabetes mellitus as a risk factor for CTRCD in patients with breast cancer (Lim et al., 2022). In addition, when it comes to ECG parameters, a greater proportion of patients without CTRCD had ECG findings that were within normal limits, whereas this proportion was lower in patients with CTRCD (92.3% vs. 40.9%). Left ventricular hypertrophy (LVH) and sinus tachycardia (2.6% vs. 18.2%) were the most significant ECG findings in patients with CTRCD.

Researchers have reported that ECG indices can be used to predict CTRCD. Negative cardiovascular outcomes are linked to sinus tachycardia (Hemu et al., 2021). In doxorubicin-treated cancer patients, other ECG indices such as T-wave changes and QT prolongation have been shown to indicate the onset of CTRCD (Kinoshita et al., 2020).

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Cardiotoxicity or long-term cardiac dysfunction are linked to the use of anthracyclines like doxorubicin (Perez et al., 2019). There was no correlation between chemotherapy and CTRCD regardless of the type of chemotherapy—anthracycline or non-anthracycline (Table 1). Conversely, (Narayan et al., 2017) demonstrated significant changes in longitudinal and circumferential strain, strain rate, and predicted a higher risk of CTRCD in cancer patients receiving anthracycline chemotherapy. It should be noted that the cardiotoxicity risk score for anthracycline drugs ranges from high to rare (Perez et al., 2019). There is a possibility of biased results with regard to the published literature on anthracycline and the risk of CTRCD because this study had a mixed cancer population and did not collect data on the stages of cancer, administered chemotherapeutic agent, dose, or schedule of chemotherapeutic treatment.

Further, the relationship of diastolic capability with CTRCD was noted in the current review. Anthracycline treatment results in diastolic dysfunction (Serrano et al., 2015), and it is known that diastolic dysfunction is associated with a higher risk of cardiovascular events or cardiotoxicity (Ladeiras-Lopes et al., 2019). This finding is supported by the fact that only a small number of studies have found a connection between CTRCD and decreased LV diastolic function. Upshaw et al., found that a 1.4% decrease in diastolic function from baseline increased the risk of developing CTRCD in a prospective study. 2020). Another parameter for detecting myocardial deformation is area strain, which is a combination of GLS and GCS (Negishi et al., 2013). After chemotherapy, we found positive strain in CTRCD patients, which suggests LV myocardial dysfunction in this context.

Breast cancer patients have been reported to have decreased GLS and LVEF following chemotherapy (Terui et al., 2022). CTRCD was defined in this study as GLS 18%. The CTRCD patients' mean post-treatment GLS value of -14.41 2.72%, as shown in Table 3, decreased significantly and remained within the high-risk cut-off range of 21.0% to 13.8%, as suggested by (Oikonomou et al., 2019). According to Lauter-Perl et al., reduced GLS has been linked to an increased risk of CTRCD in cancer patients receiving chemotherapy. 2020). According to Oikonomou et al.'s metanalytic analysis of 21 prognostic studies, relative deterioration of GLS has a prognostic value for detecting CTRCD in response to anthracycline or non-anthracycline treatment (Oikonomou et al., 2019). In addition, the CTRCD group's post-LVEF value was significantly lower than the non-CTRCD group's (60.00 0.0%, p 0.001) when compared to the pre-LVEF data.

This is consistent with published studies that define CTRCD on the basis of an absolute or relative decrease in the LVEF following treatment (reduction of 10% or >5% to 50% or 53%) (Guan et al., 2021; Narayan and other, 2016). In addition, the CTRCD group's mean post GCS value was significantly lower than the non-CTRCD group's (p 0.001) when compared to the non-CTRCD group's pretreatment GCS values. GCS as one more boundary to anticipate CTRCD has been known. Narayan et al. support this by (2016) demonstrated that the odds of CTRCD in breast cancer patients increased with each unit of circumferential strain decrease from baseline, regardless of risk factors like cancer therapy treatment.

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Table 1 shows that an elevation or increase in troponin was significantly associated with CTRCD in terms of cardiac biomarkers (95.5% vs. 3.8% in patients who did not have CTRCD). According to Cardinale et al., a troponin value of less than 0.08 ng/mL is thought to be highly predictive of low ejection fraction and cardiac risk stratification in cancer patients who have received high dose chemotherapy. 2004). In addition, patients with CTRCD had lower EF and GLS when they had elevated troponin levels (Table 5). A meta-analysis that was recently published confirmed that elevated troponin I played a significant role in predicting a decrease in LVEF (Michel et al., 2020).

The predictive power of troponin I for CTRCD has been tested in a few studies. Left ventricular hypertrophy was linked to elevated cTn following anthracycline treatment (Meessen et al., 2020) and breast cancer patients' increased risk of CTRCD (Demissei et al., 2020). According to Terui et al.'s study, breast cancer patients with CTRCD had higher native T1 levels prior to chemotherapy, demonstrating the predictive value of troponin in the detection and risk stratification of CTRCD. Therefore, the findings of this study emphasize the importance of early evaluation of strain imaging with GLS as opposed to routine echocardiography imaging, which is performed four weeks or one month after CTRCD detection (Onishi et al., 2022). 2021).

The current study has some limitations, such as a single-center design, a smaller treatment group, a lower number of CTRCD events, and a different cancer population. Additionally, the sample comprised both anthracycline and non-anthracycline chemotherapeutic treatment groups, making it impossible to determine whether troponin and CTRCD are linked to cancer therapy regimen. As a result, more research is required to determine how to apply the data to a particular cancer population and treatment. Additionally, the troponin assay/kit used in this study detected cTnI; consequently, it is still possible that a more sensitive assay, such as the hs-cTnI assay, could provide better results by detecting even lower troponin concentrations. Since the majority of patients in the current study had breast or ovarian cancer, a more restricted study with a specific cancer group is required.

For reproducible data and a definitive conclusion regarding the significance of early GLS assessment in the detection of CTRCD, a large prospective multicenter study is also required.

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Conclusion work:

As indicated, elevated troponin can indicate myocardial damage, which provides the rationale for developing strategies to counteract CTRCD during the follow-up period of treatment. The present study demonstrates that reduced early GLS measurement can predict subclinical CTRCD within a week and is correlated with positive troponin I. Subclinical cardiac dysfunction can be diagnosed earlier, allowing for better risk stratification of patients for chemotherapy and treatment, improving quality of life. To support the findings of this study, larger prospective studies focusing on a single type of cancer population are required.

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