The integrated role of NT-pro BNP and STE-GLS for the early detection of chemotherapy-induced cardiotoxicity

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Funding Acknowledgement: Type of funding source: None

Background: Chemotherapeutic agents, used for the treatment of breast cancer, have many side effects, among them is cardiomyopathy. Ejection fraction (EF) is fails to detect the subtle alterations of left ventricular (LV) function. There comes the need for a more sensitive tool for the detection of preclinical chemotherapy-induced cardiomyopathy.

Aim: Detection of subclinical LV systolic dysfunction in breast cancer patients after 6 weeks of the initiation of their chemotherapeutic treatment, using N-terminal pro brain natriuretic peptide (NT-proBNP) plasma level as well as Speckle tracking echo-global longitudinal strain (STE-GLS).

Methods: Seventy-four asymptomatic, non-metastasizing breast cancer female patients were included. They were assessed before taking their first chemotherapeutic session and 6 weeks thereafter. Assessment included baseline clinical characteristics, conventional two-dimensional (2D) as well as three-dimensional (3D) echocardiography. Loops of different apical views were recorded for later offline STE-GLS analysis. Blood samples for NT-BNP plasma level were collected before and 6 weeks after the initiation of chemotherapy. Samples were later analyzed using a Sandwich ELISA technique.

Results: The median NT-proBNP almost doubled after 6 weeks of chemotherapy (73.50 vs 34.4 pg/L, p value <0.001). One patient died before her scheduled follow up visit, and the cause of death is unknown. Fifty patients showed NT-proBNP elevation at their follow up, compared to the baseline visit, 22 (44%) of them had worse (less negative) LV-GLS in their follow up visit. Five patients had an abnormally elevated NT-proBNP plasma level, all of them had a worse follow up LV-GLS. Only two patients showed significant reduction of LVEF $>10\%$ to less $<53\%$ (chemotherapy-induced cardiotoxicity) but their NT-proBNP did not exceed the cutoff limit.

Conclusion: The integration of LV-GLS and NT-proBNP is useful in the diagnosis of subclinical, subtle chemotherapy-induced cardiotoxicity. Early detection will prompt early cardioprotective measures and thus helps improving the clinical outcomes.

Comparing patients who had lower versus those who had higher NT-proBNP at the follow up visit

Variables	Patients with lower FU NT-proBNP (n=23)			Patients with higher FU NT-proBNP (n=50)		
	Baseline	FU	p-value	Baseline	FU	p-value
2D-LVEF	61.3±5.8	62.5±7.1	0.47	61.8±4.7	59.3±4.4	0.012
3D-LVEF	60.6±5.6	60.3±6.7	0.87	62.4±5.8	59.0±6.4	0.01
2D LV-GLS	–21.0±1.9	–20.1±1.7	0.055	–21.7±2.4	–19.4±2.2	<0.001
Median NT-proBNP, (range), pg/ml	37.5 (66.0)	32.1 (62.9)	<0.001	23.7 (446.2)	91.5 (949.5)	<0.001