Evaluation of cardiac magnetic resonance imaging in detection of cardiotoxicity in patients with lymphoma treated with anthracyclines

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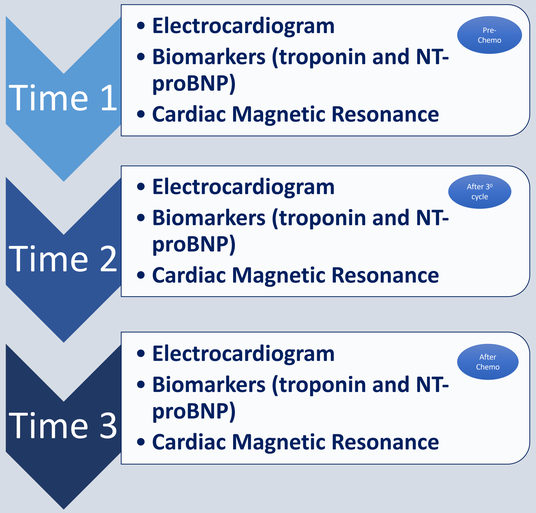
BACKGROUND

- Lymphoma treated with anthracyclines have survival rates of 86% at 5 years. However, cardiac toxicity of these drugs is common and usually leads to advanced heart failure.
- Current strategies for early detection of cardiotoxicity during chemotherapy are not yet fully established.

METHODS

- A pilot study, with a sample of 48 patients. Prospective observational study.
- **Local**: Cancer Institute of São Paulo, University of São Paulo
- **Period:** From June 2017 to March 2019.
- **Inclusion criteria:**
  - Age ≥ 18 years-old
  - Confirmed diagnosis of lymphoma
  - Candidates for chemotherapy with anthracyclines
  - Sign the informed consent
- **Exclusion criteria**
  - Previous cardiomyopathy
  - Uncontrolled hypertension
  - HIV positive
  - Renal failure (Cr> 2.0mg/dl)
  - Pregnancy
  - Compromised performance status (ECOG> 3 or KPS <60).
  - Contraindications to CMR.

- Cardiotoxicity was defined as drop of the left ventricular fraction (LVEF) > 10% or LVEF decrease below 50%.



RESULTS

Figure 1. Flowchart of the study

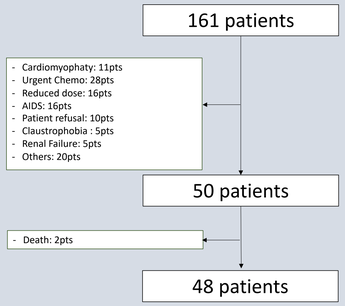


Table 1. Baseline Characteristics of the patients

Baseline	48 pcts
Age, years	45,32(±17.84)
Female	26 (52%)
White	25 (50%)
Comorbidities	
Diabetes	5 (10%)
Smoker	4 (8%)
Hypertension	9 (18%)
Stroke	0 (0%)
Dyslipidemia	5 (10%)
Hypothyroidism	0 (0%)
Coronary Artery Disease	0 (0%)
Family History of CAD	3 (6%)
Renal Failure	0 (0%)
Previous cancer	1 (2%)
Karnofsky	
100	22 (44%)
90	22 (44%)
80	4 (8%)
70	2 (4%)
ECOG	
0	21 (42%)
1	26 (52%)
2	3 (6%)

Figure 2. Baseline Characteristics of the patients

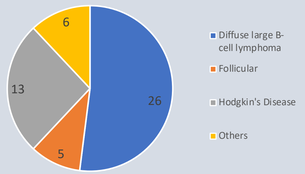


Figure 3. Biomarkers evalutation

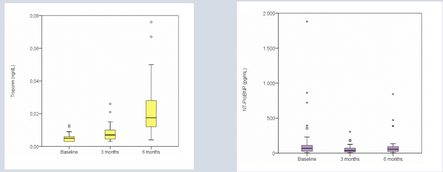


Table 2. CMR parameters evaluated according to the presence of cardiotoxicity

CMR parameters	Cardiotoxicity		
	No 35 (73%)	Yes 13 (27%)	p
EDD Time 1	50.29 ± 5.51 mm	52.47 ± 6.22 mm	0.246
EDD Time 2	49.49 ± 5.17 mm	52.87 ± 5.91 mm	0.068
EDD Time 3	**50.52 ± 4.6 mm**	**55.29 ± 6.41 mm**	**0.013**
ESD Time 1	31.94 ± 4.6 mm	33.94 ± 7.15 mm	0.258
ESD Time 2	32.94 ± 4.74 mm	36.64 ± 5.06 mm	0.028
ESD Time 3	**33.71 ± 4.26 mm**	**39.76 ± 5.26 mm**	**0.001**
EDV Time 1	116(103.57–138.12) ml	136.31(115.76 – 173.81) ml	0.069
EDV Time 2	116.48(104.21–152.78) ml	140.55(123.95 – 171.54) ml	0.100
EDV Time 3	127(114.84 – 144.6) ml	152.01 (115.91 – 196.37) ml	0.256
ESV Time 1	46(38.0 – 58.46) ml	63.0(44.5 – 74.22) ml	0.069
ESV Time 2	49.5 (39.18 – 64.14) ml	65.12 (43.23 – 83.23) ml	0.072
ESV Time 3	**54.7 (45.0 – 67.0) ml**	**78.5 (53.99 – 96.27) ml**	**0.007**
	EJECTION FRACTION		
RVEF Time 1	54.72 ± 8.14%	53.47 ± 8.61%	0.645
RVEF Time 2	50.12 ± 7.26%	51.45 ± 6.54%	0.579
RVEF Time 3	**53.41 ± 9.73%**	**46.29 ± 3.93%**	**0.002**
LVEF Time 1	59.57 ± 7.03%	59.15 ± 8.23%	0.861
LVEF Time 2	59.75 ± 7.3%	53.72 ± 7.88%	0.021
LVEF Time 3	**58.7 ± 5.69%**	**46.67 ± 8.12%**	**0.000**
LV Mass Time 1	77.37 ± 22.12g	85.69 ± 29.44g	0.296
LV Mass Time 2	69.06 ± 22.07g	82.2 ± 22.68g	0.086
LV Mass Time 3	67.89 ± 19.33g	85.25 ± 28.72g	0.033
	MYOCARDIUM STRAIN		
GLS Time 1	-15.94 ± 2.91%	-14.84 ± 2.65%	0.243
GLS Time 2	-14.78 ± 2.07%	-10.47 ± 8.24%	0.100
GLS Time 3	**-13.92 ± 1.76**	**-12.44 ± 2.7 %**	**0.043**
Circumferential Time 1	-17.05 ± 2.71%	- 15.35 ± 2.11 %	0.048
Circumferential Time 2	-15.52 ± 2.15 %	-13.39 ± 3.05%	0.013
Circumferential Time 3	-15.13 ± 1.98%	-13.64 ± 3.36%	0.097
Radial Time1	30.28 (25-38.57)%	26.06 (23.52 – 29.96)%	0.096
Radial Time2	25.14 (22.66 – 29.22)%	20.14 (15.58 – 28.25)%	0.066
Radial Time3	**22.9(21.18 – 27.43)%**	**19.84(17.12 – 21.73)%**	**0.017**

T1 Mapping			
NativeT1 Time1	1540.61 (1478.26 – 1591.14)ms	1514.77 (1487.47 – 1786.32) ms	0.568
NativeT1 Time2	1537.75 (1493.76 – 1589.72) ms	1601.99 (1501.12 – 1673.44) ms	0.383
NativeT1 Time3	1538.43 (1479.03 – 1633.60)ms	1612.85 (1522.74 – 1638.34)ms	0.289
ECV Time1	25.85 (22.93 – 31.84)ms	25.28 (19.69 – 30.68)ms	0.487
ECV Time2	25.17 (23.62 – 32.83)ms	24.42 (22.75 – 27.47) ms	0.281
ECV Time3	27.5 (23.59 – 31.9)ms	27.2 (23.84 – 28.47)ms	0.529

- **Others clinical Outcomes:**
  - Sepsis/Septic shock : 8 (16.0%) patients
  - Thromboembolism: 4 (8.0%) patients
  - Death: 2 (8.0%) patients

CONCLUSIONS

- Cardiotoxicity is a frequent complication in anthracycline treated patients. CMR evaluation, through analysis of volumes, ejection fraction and strain might early identify these patients.

CLINICAL IMPLICATIONS

- Early detection of cardiotoxicity aiming to initiate preventive strategies to avoid heart failure.

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DISCLOSURES

All the authors have no conflicts of interest to disclose.