Myocardial function in asymptomatic children with type 1 diabetes

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01 Background

Diabetic cardiomyopathy is defined as a myocardial dysfunction which is independent from any other ischemic, valvular or hypertensive etiology. It is a multifactorial condition caused mainly by a change in the myocardial structure leading sometimes to fibrosis especially in adolescents and adults with poor diabetes control.

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02 Aim

To assess, using conventional and nonconventional echocardiographic tools, whether children and adolescents with type 1 diabetes have early echocardiographic signs of subclinical ventricular dysfunction; and whether diabetic control has any influence

03 Methods

Prospective, analytical case-control type study

Case group (G1) = 40 children aged 6 to 16 years old and with type 1 diabetes of at least one year duration

C***ontrol group (G2)=*** 31 healthy children similar in terms of age and sex.

Inestigations: (carried out in all patients in G1 and G2)

- ***Conventional transthoracic echocardiography***
- ***Tissue Doppler imaging*** (early (E, E' wave) and late (A, A' wave) diastolic myocardial velocity and their ratio)
- ***Two- dimensional speckle tracking echocardiography***.
- ***Calculation of: ejection fraction (EF); and strain (S) measured as global (GS) and longitudinal (LS), in apical (A), mid (M) and basal (B) ventricle***
- *Glycated hemoglobin was measured in all patients.

04 Results

1. Clinical characteristics (Tables 1)

Table 1: Clinical features in G1 vs G2

	G1 (n=40)	G2 (n=31)	P
Sex (F/M)	18/22	11/20	0,102
Age (years)	10,59 ± 4,76	9,9 ± 3,4	0,485
BMI	18,44 ± 2,48	17,46 ± 3,25	0,630
Heart rate	83 ±14	74 ± 11	0,421
Systolic BP	112 ± 13	107 ± 11	0,192
Diastolic BP	69 ± 08	70 ± 12	0,713

2. Therapeutic characteristics and evolution (Fig1)

- Duration of T1D: 5,19 ± 0,6 years
- Treatment of T1D:

Regular insuline + insulatard in 17/40

Insulin analogues (basal-bolus) in 23/40

- Mean (SD) HBA1C: 8,97 ±1,17

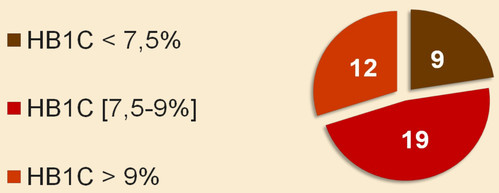

Fig 1: Diabetes control

3. ultrasound features (Tables 2, 3, fig 2)

Table 2: Systolic function of LV and RV

	G1 (n=40)	G2 (n=31)	p
LV EF (%)	63,8 ± 4,92 (NV*)	63,9 ± 4,9	NS
LV RF (%)	38,2 ± 4,16 (NV*)	37,9 ± 3,2	NS
LV GS (%)	-20,66 ± 3,46	-20,01 ± 2,42	NS
LV LS (%)	-20,83 ± 1,92	-21,34 ± 2,31	NS
LV ALS (%)	-18,78 ± 2,33	-19,89 ± 3,48	NS
LV MLS (%)	-20,54 ± 2,81	-21,79 ± 3,61	NS
LV BLS (%)	-18,23 ± 2,82	-20,94 ± 3,93	0,032
RV LS (%)	29,12 ± 1,23	28,81 ± 1,64	NS
RV ALS (%)	24,16 ± 1,73	-23,27 ± 2,43	NS
RV MLS (%)	-31,24 ± 1,44	-28,20 ± 2,76	NS
RV BLS (%)	-32,57 ± 2,06	-33,74 ± 1,63	NS

Table 3: Diastolic function of LV and RV

		G1 (n=40)	G2 (n=31)	p
LV	E (m/s)	0,76 ± 0,17	0,72 ± 0,15	NS
	A (m/s)	0,63 ± 0,17	0,59 ± 0,14	0,031
	E/A	1,74 ± 0,51	1,88 ± 0,53	0,023
	E' (m/s)	0,15 ± 0,02	0,16 ± 0,02	NS
	A' (m/s)	0,68 ± 0,01	0,63 ± 0,01	0,048
	E'/A'	2,08 ± 0,51	2,31 ± 0,42	0,045
RV	E (m/s)	0,61 ± 0,14	0,63 ± 0,14	NS
	A (m/s)	0,41 ± 0,129	0,4 ± 0,122	NS
	E/A	1,54 ± 0,42	1,61 ± 0,43	NS
	E' (m/s)	0,15 ± 0,02	0,16 ± 0,03	NS
	A' (m/s)	0,13 ± 0,04	0,09 ± 0,02	NS
	E'/A'	1,74 ± 0,63	1,88 ± 0,57	NS

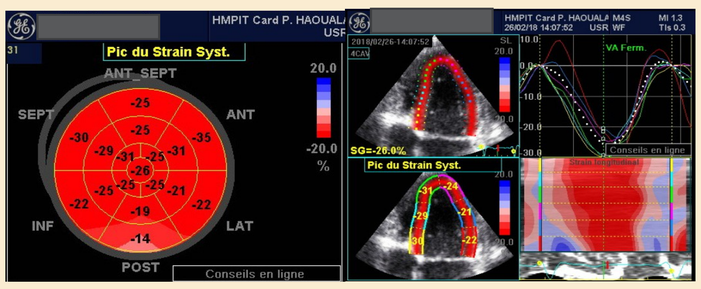

Fig 2: Strain image in a child with DT1

The STRAIN was abnormal in:

- 05 /40 for LV GS

- 11/40 for LV BLS

-03/40 for RV GS

-06/20 for RV BLS

In G1:

LV diastolic function was altered in 13/40 cases

BLS LV was altered in 11/40 cases → partial systolic dysfunction

L Strain abnormalities was always associated with diastolic dysfunction

Inverse Correlation between:

- duration of diabetes and E/A and E'/A' (*Pearson* correlation coefficient -0,22 and - 0,28)
-decrease in E/A and E'/A' (*Pearson* correlation coefficient -0,31 and -0,42)

05 Discussion

✓ Few studies treated of subclinical systolic dysfunctions in children and adolescents with type 1 diabetes mellitus (DM), and so the available data are limited [1,2] . Our study is the first Tunisian paediatric study in that field.

Altun[1] showed a: - LV diastolic dysfunction in the patients with diabetes

- LV longitudinal and radial function impairment in asymptomatic children with type 1 DM who have normal LV ejection fraction by 2DSTE

✓ Our results are similar. We conclude that LV EF is not an accurate parameter in asymptomati*c* patients. STRAIN and Doppler must be done to diagnose early stage ventricular dysfunction.

✓Prognosis of the cardiac function is related to the diabetic control and children already having significant changes in myocardial diastolic function of the LV seem to be at risk of developing further cardiac dysfunctions [3].

04 CONCLUSION

The study results showed an early and asymptomatic diastolic left ventricular dysfunction. This diastolic dysfunction preceded the systolic dysfunction. This implicates an optimal control of the diabetes and the prevention of other cardiovascular risk factors

06 REFERENCES

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