Myocardial function in asymptomatic children with type 1 diabetes

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Diabetic cardiomyopathy is defined as a myocardial dysfunction which is independent from any other ischemic, valvar 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.

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

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

In investigations:
- Carried out in all patients in G1 and G2
- 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

Results

1. Clinical characteristics (Tables 1)  

Table 1: Clinical features in G1 vs G2

<table>
<thead>
<tr>
<th></th>
<th>G1 (n=40)</th>
<th>G2 (n=31)</th>
<th>P</th>
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<tbody>
<tr>
<td>Sex (F/M)</td>
<td>18/22</td>
<td>11/20</td>
<td>0.102</td>
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<tr>
<td>Age (years)</td>
<td>10.59 ± 4.76</td>
<td>9.9 ± 3.4</td>
<td>0.485</td>
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<tr>
<td>BMI</td>
<td>18.44 ± 2.48</td>
<td>17.46 ± 3.25</td>
<td>0.630</td>
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<td>Heart rate</td>
<td>83 ± 14</td>
<td>74 ± 11</td>
<td>0.421</td>
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<tr>
<td>Systolic BP</td>
<td>112 ± 13</td>
<td>107 ± 11</td>
<td>0.192</td>
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<tr>
<td>Diastolic BP</td>
<td>69 ± 08</td>
<td>70 ± 12</td>
<td>0.713</td>
</tr>
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2. Therapeutic characteristics and evolution (Fig 1)
- Duration of T1D: 5.19 ± 0.6 years
- Treatment of T1D: Regular insulin + insulatard in 17/40
- Mean (SD) HBA1C: 8.97 ± 1.17

2. 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.
- Altun1 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 asymptomatic 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.

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

References
3-Abdel-Moez Ali B and al. Assessment of ventricular dysfunctions in children with Type 1 Diabetes Mellitus (T1DM). Current Pediatric Research. 2017;21(2)

Fig 1: Diabetes control

Fig 2: Strain image in a child with T1D

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)