Association of recreational drug consumption, cardiac toxicity and heart transplantation

Cardiac toxicity from recreational drug use remains difficult to establish. We report the cases of 3 young patients who were hospitalized for cardiogenic shock. All were bridged to transplantation with implantation of a left ventricular assist device (LVAD). They underwent uneventful heart transplantation. The patients did not have any significant personal or family medical history, but all admitted consuming large quantities of recreational drugs daily. Histological examination of the native heart did not show any inflammation or infiltrative myocardial disease. In this series of young patients presenting in cardiogenic shock with minimal histologic findings on examination of the native hearts, the association between cardiac toxicity and active use of recreational drugs remains a strong possibility. The transplant community should be made aware of this possible association in the current era of legalization and social trivialization of drug consumption.
Echocardiographic exams showed a significant decrease in left ventricular ejection fraction and an enlarged left ventricular cavity at the time of admission and of invasive intervention (Table 1).

<p>| Table 1. Transthoracic echocardiographic exams at hospital admission |
|---------------------------------|-------------------|-----------------|------------------|</p>
<table>
<thead>
<tr>
<th>Patient</th>
<th>LV diastolic diameter</th>
<th>LV ejection fraction</th>
<th>LV mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>71 mm</td>
<td>15%</td>
<td>155 g/m²</td>
</tr>
<tr>
<td>2</td>
<td>68 mm</td>
<td>15%</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>55 mm</td>
<td>30%</td>
<td>79 g/m²</td>
</tr>
</tbody>
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LV = left ventricular.

All 3 patients underwent implantation of HeartMate left ventricular assist device (LVAD) support as a bridge to transplantation a few days after hospital admission and after implantation of the ECMO support in the youngest patient. The patient with repeated episodes of VT underwent cryosurgery ablation of the tachycardia as a concomitant surgical procedure with LVAD implantation. The 3 patients underwent successful heart transplantation after an average waiting time of a few months with their LVAD in place, with obvious total abstinence from the use of recreational drugs, confirmed by regular urine toxicity screenings.

Pathological analysis of the explanted hearts showed a normal histological aspect of the cardiomyocytes, minimal coronary atherosclerotic changes in 2 patients and evidence of subendocardic necrosis in the patient who underwent cryosurgical ablation of the VT. There was no evidence of inflammation or any specific change suggesting an acute myocarditis or an infiltrative myocardial disease. There was no evidence of amyloidosis or hemochromatosis at specific staining examination. There was no coronary occlusion or intraluminal thrombus formation. The short-term clinical course after heart transplantation was favourable, and no specific complications or recurrence of recreational drug usage were encountered at the time of this report.

Regular use of a combination of recreational drugs, such as cannabis, amphetamines and cocaine, was associated with acute cardiac decompensation, symptoms of congestive heart failure with cardiogenic shock and a presumed diagnosis of idiopathic cardiomyopathy in our small series of patients. The acute decompensation required implantation of mechanical support as a bridge to heart transplantation in all 3 patients. Interestingly, there was no histologic evidence of scar fibrosis, inflammation or infiltrative disease at microscopic evaluation of the native hearts.

Although the exact mechanism of cardiotoxicity remains elusive, an increased mitochondrial superoxide production has been suggested. In a recent study, cocaine and ethanol, both together and independently, increased mitochondrial hyperpolarization and activation of common apoptosis pathways in cardiomyocytes.

Although in 2015 the European Drug Emergencies Network reported that 35 patients presented with cardiac arrest at emergency departments during a 12-month study period, cardiac arrest and decompensation remain a small fraction of the total volume of emergency admissions following the use of recreational drugs. Moreover, there are no data on the effect of a combination of recreational drugs and alcohol on the cardiac health status of users, but we can speculate that this would increase toxicity and adverse effects.

**CONCLUSION**

We suggest that an association between regular and active use of a combination of recreational drugs and acute cardiac decompensation with cardiogenic shock remains a strong possibility in the present series of patients. Raising awareness about the potential cardiac toxicity of these recreational drug combinations is of utmost importance. Indeed, with the current Canadian legislation allowing the legal procurement and usage of cannabis, we might expect an increase in the number of young patients with acute cardiac decompensation necessitating mechanical support of the failing heart and cardiac transplantation.

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**References**