Stress Myocardial Perfusion Imaging in An Elderly Man With COPD

Case Discussion Provided by
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INDICATION
Lexiscan® (regadenoson) injection is a pharmacologic stress agent indicated for radionuclide myocardial perfusion imaging (MPI) in patients unable to undergo adequate exercise stress.

IMPORTANT SAFETY INFORMATION

CONTRAINDICATIONS
Do not administer Lexiscan to patients with second- or third-degree AV block or sinus node dysfunction unless these patients have a functioning artificial pacemaker.

WARNINGS AND PRECAUTIONS

Myocardial Ischemia
Fatal and nonfatal myocardial infarction, ventricular arrhythmias, and cardiac arrest have occurred following Lexiscan injection. Avoid use in patients with symptoms or signs of acute myocardial ischemia, for example unstable angina or cardiovascular instability; these patients may be at greater risk of serious cardiovascular reactions to Lexiscan. Cardiac resuscitation equipment and trained staff should be available before administering Lexiscan. If serious reactions to Lexiscan occur, consider the use of aminophylline, an adenosine antagonist, to shorten the duration of increased coronary blood flow induced by Lexiscan.

Sinoatrial and Atrioventricular Nodal Block
Adenosine receptor agonists, including Lexiscan, can depress the SA and AV nodes and may cause first-, second-, or third-degree AV block, or sinus bradycardia requiring intervention. In postmarketing experience, heart block (including third degree), and asystole within minutes of Lexiscan administration have occurred.

Hypersensitivity, Including Anaphylaxis
Anaphylaxis, angioedema, cardiac or respiratory arrest, respiratory distress, decreased oxygen saturation, hypotension, throat tightness, urticaria and rashes have occurred. In clinical trials, hypersensitivity reactions were reported in fewer than 1 percent of patients.

Hypotension
Adenosine receptor agonists, including Lexiscan, induce arterial vasodilation and hypotension. The risk of serious hypotension may be higher in patients with autonomic dysfunction, hypovolemia, left main coronary artery stenosis, stenotic valvular heart disease, pericarditis or pericardial effusions, or stenotic carotid artery disease with cerebrovascular insufficiency. In postmarketing experience, transient ischemic attacks, seizures and syncope have been observed.

Hypertension
Adenosine receptor agonists, including Lexiscan, may result in clinically significant increases in blood pressure in some patients. In postmarketing experience, cases of potentially clinically significant hypertension have been reported, particularly in patients with underlying hypertension and when low-level exercise was included in the MPI.

Bronchoconstriction
Adenosine receptor agonists, including Lexiscan, may cause dyspnea, bronchoconstriction and respiratory compromise. Appropriate bronchodilator therapy and resuscitative measures should be available prior to Lexiscan administration.

ADVERSE REACTIONS
The most common adverse reactions (≥5%) to Lexiscan are dyspnea, headache, flushing, chest discomfort, angina pectoris or ST-segment depression, dizziness, chest pain, nausea, abdominal discomfort, dysgeusia, and feeling hot. Most adverse reactions began soon after dosing, and generally resolved within approximately 15 minutes, except for headache, which resolved in most patients within 30 minutes. Aminophylline was used as a reversal agent in 3% of patients.

In postmarketing experience, the following adverse reactions have occurred: myocardial infarction, cardiac arrest, ventricular arrhythmias, supraventricular tachyarrhythmias including atrial fibrillation or flutter, heart block, asystole, marked hypertension, hypotension, seizure, syncope, QTc prolongation, tremor, abdominal pain in association with nausea, vomiting, or myalgias, diarrhea, fecal incontinence, wheezing and musculoskeletal pain.

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A 77-year-old male presented to his primary care physician’s office with a 2-month history of increasing pedal edema and progressive exertional dyspnea. He had a history of chronic obstructive pulmonary disease (COPD). The patient also had a number of cardiac risk factors, including central obesity (267 lb and a body mass index [BMI] of 35.8 kg/m²), hypertension, dyslipidemia, an approximately 1 pack-per-week history of smoking, adult-onset diabetes mellitus, and a brother who died of myocardial infarction. His current medications are listed in Table 1.

<table>
<thead>
<tr>
<th>Medicine 1</th>
<th>Medicine 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolterodine</td>
<td>Metformin</td>
</tr>
<tr>
<td>Tamsulosin</td>
<td>Naproxen</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>Potassium</td>
</tr>
<tr>
<td>Furosemide</td>
<td>Simvastatin</td>
</tr>
</tbody>
</table>

Table 1. Current medications.
The patient was admitted to the hospital for diuresis and assessment of new-onset congestive heart failure (CHF) versus cardiac asthma. His laboratory results are shown in Table 2.

### Table 2. Laboratory results.

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin</td>
<td>13.5 g/dL</td>
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<tr>
<td>Hematocrit</td>
<td>40%</td>
</tr>
<tr>
<td>WBC</td>
<td>8.6 x 10⁹/L</td>
</tr>
<tr>
<td>RBC</td>
<td>4.28 x 10¹²/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>138 mmol/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>5.2 mmol/L</td>
</tr>
<tr>
<td>BNP</td>
<td>72 ng/L</td>
</tr>
<tr>
<td>Glucose</td>
<td>259 mg/dL</td>
</tr>
<tr>
<td>Troponin I</td>
<td>0.08 mg/L</td>
</tr>
<tr>
<td>Urinalysis</td>
<td>Neg.</td>
</tr>
<tr>
<td>BUN</td>
<td>48 mg/dL</td>
</tr>
<tr>
<td>Creatinine</td>
<td>1.7 mg/dL</td>
</tr>
<tr>
<td>aBNP</td>
<td>72 ng/L</td>
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![](abg.png)

PHYSICAL EXAM

At the time of admission, the patient was not experiencing chest pain or shortness of breath at rest. There were positive signs of jugular venous distention and rhonchus with scattered expiratory wheezing in both lung fields. The patient had 1+ to trace bilateral pretibial edema.

ECHOCARDIOGRAM FINDINGS

The patient was referred for 2D echocardiography. His results were abnormal with evidence of mild left-ventricular (LV) dilatation, preserved LV contractility with aortic root dilatation, annular calcification, and sclerosis of the aortic valve leaflets without significant aortic stenosis. His LV ejection fraction (LVEF) was 50%.

As these findings could not explain his CHF symptoms, stress single-photon emission computed tomography myocardial perfusion imaging (SPECT MPI) was ordered to rule out coronary artery disease (CAD). The patient was unable to exercise. The patient was referred for a 2-day Lexiscan stress/rest test.

SAFETY CONSIDERATIONS

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LEXISCAN SPECT MPI

The patient’s active wheezing had been pretreated in the hospital with albuterol. On day 1, the patient underwent Lexiscan stress MPI with 33.0 mCi Tc-99m sestamibi. The patient experienced mild dyspnea, but no chest pain or ischemic ECG changes. He tolerated stress and tracer administration well, and imaging was performed 60-90 minutes post-injection. On day 2, the patient returned for the rest portion of the test with 33.0 mCi Tc-99m sestamibi. Imaging was again performed 60-90 minutes post-injection.

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Lexiscan stress MPI revealed a large perfusion defect of moderate severity in the inferior lateral, posterior lateral, and inferior regions of the left ventricle (Figures 1 and 2). The rest images demonstrated significant, but not complete, reversibility in these regions. Systolic myocardial thickening and wall motion were globally depressed on the gated images. The calculated LVEF was 45%. The patient was referred for coronary angiography.

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**CORONARY ANGIOGRAPHY**

Angiography revealed a tight, 85% lesion in the dominant right coronary artery (RCA). The RCA supplied collaterals to the totally occluded proximal circumflex coronary artery (Figure 3).

**PATIENT MANAGEMENT AND FOLLOW-UP**

A 3.5 x 13 mm drug-eluting stent was placed in the RCA, and the patient was discharged to home with an ACE inhibitor, carvedilol, and long-acting nitrate therapy. Weight loss and diabetic diet were discussed in depth. The patient returned for follow-up 2 months after stent placement (Figure 4). He had improved exercise tolerance, but he continued to experience some exertional dyspnea. The patient also quit smoking.

Figure 3. Coronary angiograms.

Figure 4. RCA status 2 months after stent placement.
DISCUSSION

A 77-year-old obese diabetic male presented with exertional dyspnea and active wheezing. His symptoms suggested cardiac asthma\(^1\); however, he did not respond to intravenous furosemide, and a 2D echocardiogram did not support the initial diagnosis of CHF due to LV dysfunction. With Lexiscan stress/rest SPECT MPI and coronary angiography, a diagnosis of coronary ischemia was established and the patient was successfully treated, as measured by a reduction in the patient’s symptoms of exertional dyspnea and improved exercise tolerance.

This patient was unable to exercise. Lexiscan was the pharmacologic stress agent chosen. The incidence of bronchoconstriction after administration of Lexiscan has been assessed in a large clinical study in 999 patients with asthma or COPD.\(^2\) In this study, Lexiscan was not statistically significantly different from placebo in the proportions of subjects experiencing bronchoconstriction at 2 hours post-baseline (1.1\% vs 2.9\% in the asthma group, 4.2\% vs 5.4\% in the COPD group).\(^4\) Nevertheless, all adenosine receptor agonists, including Lexiscan, may cause bronchoconstriction, and appropriate bronchodilator therapy and resuscitative measures should be available prior to Lexiscan administration.\(^2\)

SAFETY CONSIDERATIONS

Aminophylline may be administered in doses ranging from 50 mg to 250 mg by slow IV injection (50 mg to 100 mg over 30-60 seconds) to attenuate severe and/or persistent adverse reactions to Lexiscan.

\(^4\) Bronchoconstriction was defined as a >15\% decrease in FEV\(_1\), (forced expiratory volume – the volume of air that can be forced out in 1 second after taking a deep breath).

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References