PHARMACOLOGIC STRESS MYOCARDIAL PERFUSION IMAGING IN A Patient With COPD Treated for Multivessel CAD

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Note: Photo does not depict patient in this case study.
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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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MYOCARDIAL PERFUSION IMAGING IN A Patient With COPD Treated for Multivessel CAD

CASE DISCUSSION
Gregory S. Thomas, MD, MPH

PATIENT PRESENTATION AND HISTORY

A 73-year-old man presented with recent exacerbation of chronic dyspnea. He had undergone quintuple coronary artery bypass grafting (CABG) for treatment of 3-vessel coronary artery disease (CAD) 5 years earlier. One year later, the patient developed angina and angiography revealed occlusion of 3 grafts. Multivessel stenting was performed.

The patient’s weight was 266 lb and his height was 73". His cardiac risk factors included hypertension and hyperlipidemia. His history also included chronic obstructive pulmonary disease (COPD) secondary to past smoking. Before quitting 35 years earlier, he had smoked 1 pack per day for 10 to 15 years. In addition to COPD, the patient had a history of past bronchitis, pneumonia, gastroesophageal reflux disease, sinusitis, and hoarseness. He suffered from occasional wheezing but not at this time.

In pulmonary function testing (PFT) performed 3 years earlier, FEV1/FVC was 1.5/1.84 (34%/43% of predicted). With a bronchodilator, results of PFT improved to 1.84/2.3 (43%/53% of predicted). In PFT performed 3 weeks prior to presentation, FEV1/FVC was 2.08/3.23 (50%/60% of predicted), improving to 2.26/3.68 (55%/67% of predicted) with a bronchodilator. Current medications included statin, aspirin, clopidogrel, diltiazem, tiotropium bromide, fluticasone propionate 250 mcg/salmeterol 50 mcg, albuterol inhaler, and prednisone.
STRESS MYOCARDIAL PERFUSION IMAGING (MPI)

The patient was referred for stress MPI. Because of his weight and known poor exercise tolerance, pharmacologic stress was indicated and Lexiscan was chosen. Two-day rest/Lexiscan stress single-photon emission computed tomography (SPECT) imaging was performed with Tc-99m sestamibi. The patient was pretreated with 2 puffs of albuterol 5 minutes before Lexiscan administration. This procedure is analogous to the protocol described by Reyes et al for adenosine stress testing in COPD patients.1

Adenosine receptor agonists, including Lexiscan, may induce dyspnea, bronchoconstriction and respiratory compromise in patients with COPD or asthma.2 The incidence of respiratory adverse reactions after administration of Lexiscan has been assessed in a large clinical study in patients with asthma or stable COPD.2 For this patient, appropriate bronchodilator therapy and resuscitative measures were available prior to Lexiscan administration, as recommended.2

The patient had a resting heart rate (HR) of 70 bpm and a baseline blood pressure (BP) of 120/70 mm Hg. During Lexiscan stress, peak HR was 72 bpm and peak BP was 130/70 mm Hg. The resting electrocardiogram (ECG) showed first-degree AV block and nonspecific ST- and T-wave changes (Figure 1a). There was no significant change in the ECG with administration of Lexiscan (Figure 1b). The patient developed mild dyspnea following Lexiscan infusion, but no wheezing was observed on auscultation.

Figure 1a. Resting ECG.

Figure 1b. Lexiscan stress ECG.
Review of the rotating raw images is recommended prior to review of perfusion and wall motion. In this patient, the raw images demonstrated no patient motion following application of motion correction software (Figure 2).

Figure 2. Raw images at rest (left) and with Lexiscan stress (right).
Visit the resources section of www.lexiscan.com to see a video of these images.
Perfusion imaging showed a reversible proximal and mid lateral wall defect, and a small, mild intensity fixed mid anterior wall defect (Figure 3).

Figure 3. SPECT images with Lexiscan stress and at rest.
Gated SPECT revealed abnormal septal wall motion secondary to CABG and hypokinesis of the proximal inferior wall (Figure 4a). The left ventricular ejection fraction (LVEF) was 63%. The 2-day study allowed both post-stress and at-rest gated imaging to be performed. Volumetric 3-dimensional images showed no difference in wall motion post-stress and at rest (Figure 4b).

Figure 4a. Gated SPECT images with Lexiscan stress. 
Visit the resources section of www.lexiscan.com to see a video of these images.

Figure 4b. Volumetric gated SPECT images post-Lexiscan stress and at rest. 
Visit the resources section of www.lexiscan.com to see a video of these images.
The images were also compared with those from adenosine dual-isotope SPECT performed on this patient 2.5 years earlier. Comparison of the images showed that perfusion was unchanged (Figure 5a). Comparison of the gated images showed that wall motion and LVEF were also unchanged, with proximal inferior hypokinesis and abnormal septal motion evident in the previous study (Figure 5b).

**Figure 5a.** Perfusion images from adenosine dual-isotope SPECT performed 2.5 years earlier.

**Figure 5b.** Gated images from adenosine dual-isotope SPECT performed 2.5 years earlier.
DISCUSSION

The follow-up MPI results were similar to those from earlier MPI, with no change observed in perfusion or wall motion. This suggests a finding of stable obstructive CAD. It was determined that coronary angiography was unnecessary and the patient’s medical therapy was continued.

As part of a pilot study in patients with moderate and severe COPD, Lexiscan was well tolerated by this individual. Pretreatment with an albuterol inhaler was given to prevent potential side effects. Adenosine receptor agonists, including Lexiscan, may induce dyspnea, bronchoconstriction and respiratory compromise in patients with COPD or asthma. Resuscitative measures should be available.

SAFETY CONSIDERATIONS

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NOTES
References


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