ASNC

ASNC STRESS TESTING PRACTICE POINTS

Pharmacologic Stress Testing – Dobutamine

OVERVIEW

The purpose of this document is to provide a guide to the performance of pharmacologic stress testing with dobutamine. The critical components of dobutamine stress testing will be specifically outlined and will serve as a standard for all nuclear cardiology laboratories. It will cover mechanism of action, indications and patient selection, dosage, side effects, testing procedure, indications for reversal of infusion, contraindications and relative contraindications.

MECHANISM OF ACTION

Dobutamine is a synthetic catecholamine stress agent that works by stimulating the βreceptor (β_1 and β_2), resulting in an increase in HR, BP, and myocardial contractility similar to exercise. Dobutamine increases regional myocardial blood flow based on physiologic principles of coronary flow reserve. A dose-related increase in subepicardial and subendocardial blood flow occurs in vascular beds supplied by normal coronary arteries; however, blood flow increases minimally within vascular beds supplied by significantly stenosed arteries. At a dose of 20 mcg/kg/min, dobutamine-induced coronary flow heterogeneity is similar to that induced by exercise, but is less than that induced by adenosine or dipyridamole. The plasma half-life of dobutamine is 2 minutes with the onset of action in 1 to2 minutes. Up to 10 minutes may be required to obtain the peak effect.

INDICATIONS AND PATIENT SELECTION

- Dobutamine is a *secondary* pharmacologic stressor that is recommended *only* in patients who cannot undergo exercise and who have contraindications to pharmacologic vasodilator stressors. Dobutamine is the preferred agent for pharmacologic stress in patients with a history of significant reactive airway disease or severe obstructive pulmonary disease.
- Note that vasodilator stress testing, not dobutamine is preferred in patients with left bundle branch block, pre-excitation, and paced rhythms.

DOSE

Dobutamine is administered incrementally beginning at a dose of 5 or 10 mcg/kg/min, which is increased at 3-minute intervals to 20, 30, and 40 mcg/kg/min. Use a weight-based dose up to 250 lbs.

Radiotracer is injected at peak HR with dobutamine infusion continuing for 1 minute following tracer injection.

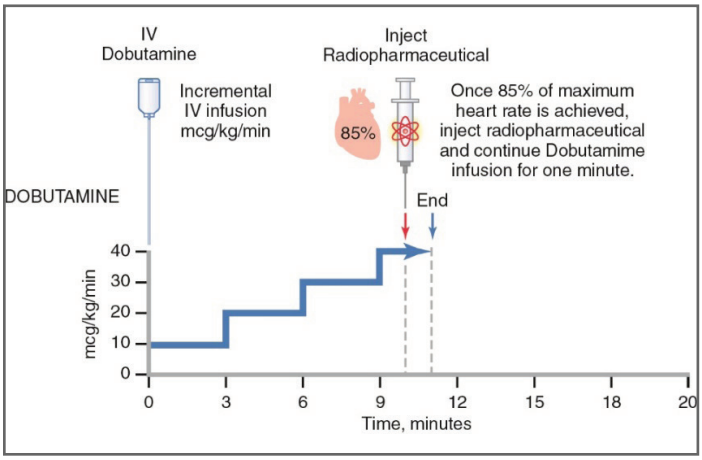

Figure 3: Dobutamine Protocol

HEMODYNAMIC EFFECTS AND SIDE EFFECTS

Hemodynamic effects are dose dependent and vary based on the maximum infusion rate obtained.
Common side effects include:

Chest Pain	31%
Palpitations	29%
Headache	14%
Flushing	14%
Dyspnea	14%
Significant supraventricular or ventricular arrhythmias	8-10%
Ischemic ST-segment depression	~33%

Severe side effects may require IV administration of a sort-acting βblocker such as esmolol (0.5 mg/kg over 1 minute) or IV metoprolol (5 mg).

ASNC

ASNC
PRACTICE POINTS

Pharmacologic Stress Testing – Dobutamine

PROCEDURE

- *Patient preparation*: patients should not eat for at least 3 hours prior to testing. If possible, β-blockers should be held for 24 hours prior to testing.
- *Monitoring*: ECG monitoring should be performed similar to other forms of pharmacologic stress testing. A 12-lead ECG should be recorded every minute during dipyridamole infusion, and at least every 3 to 5 minutes into recovery or until stable. Blood pressure should be monitored every minute during infusion and every 3 to 5 minutes or until stable during recovery.
- Protocol
  - An infusion pump is necessary for dobutamine administration. A dual-port Y-connector is required for injecting the radioisotope during dobutamine infusion.
  - Dobutamine is infused beginning at 5 or 10 mcg/kg/min which is increased at 3 minute intervals to 20, 30, and 40 mcg/kg/min.
  - Radiotracer: The radiotracer is injected at peak heart rate with dobutamine infusion continuing for 1 minute following tracer injection. A target heart rate of 85% of predicted HR is desirable.
  - Some investigators recommend the addition of atropine in divided doses of 0.25 to 0.5 mg, up to 1 to 2 mg in patients who do not achieve their target heart rate with dobutamine dose. See Figure 3.

INDICATIONS FOR TERMINATION OF DOBUTAMINE INFUSION

- Achieving >85% of the age-predicted peak HR (after maintaining for 1 minute following radiotracer injection)
- Severe hypotension (systolic BP <80 mmHg)
- Severe hypertension (systolic BP >230 mmHg or diastolic BP >115 mmHg)
- Significant cardiac arrhythmia: termination for ventricular tachycardia is more likely with dobutamine than with other stressors.
- Severe chest pain associated with ST depression of 2 mm or greater.
- Signs of poor perfusion (pallor, cyanosis, cold skin)
- Technical problems with the monitoring equipment
- Patient's request to stop.

INDICATIONS FOR REVERSAL OF COMPLICATIONS AND SIDE EFFECTS OF DOBUTAMINE

- Severe hypertension (systolic BP >220/110 mmHg)
- Significant cardiac arrhythmia
- Severe chest pain associated with ST depression of 2 mm or greater

Reversal is performed via the IV administration of a short acting β-blocker (esmolol, 0.5 mg/kg over 1 minute or metoprolol 5 mg)

ASNC

ASNC PRACTICE POINTS

Pharmacologic Stress Testing – Dobutamine

CONTRAINDICATIONS

Unstable angina, acute coronary syndrome, or less than 2 to 4 days after an acute myocardial infarction.
Hemodynamically significant left ventricular outflow tract obstruction
Atrial tachyarrhythmias with uncontrolled ventricular response
Prior history of ventricular tachycardia
Uncontrolled hypertension (systolic BP > 200 mmHg or diastolic BP > 11 mmHg)
Patients with known aortic dissection
Known hypersensitivity to dobutamine

RELATIVE CONTRAINDICATIONS

Patients who are on β-blockers where the heart rate and inotropic responses to dobutamine will be attenuated
Severe aortic stenosis
Patients with symptomatic large and/or symptomatic aortic aneurysm
Left bundle branch block
Paced ventricular rhythm

SUGGESTED READING

Henzlova MJ, et al. ASNC imaging guidelines for SPECT nuclear cardiology procedures: Stress, protocols and tracers. J. Nucl Cardiol. 2016; doi:10.1007/s12350-015-0387-x

ASNC thanks the following members for their contributions to this document:

Writing Group:
Dr. Richard Weinberg, MD, PhD
Dr. Renee Bullock-Palmer, MD

Reviewers:
Dr. Milena Henzlova, MD, PhD