

TITLE: Myocardial Perfusion Scanning Guideline

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1 INTRODUCTION/ BACKGROUND

Myocardial Perfusion Scanning is a non-invasive method of diagnosing coronary artery disease and is recognised by NICE as appropriate functional imaging for angina. A Stress/Rest Myocardial Perfusion Imaging (MPI) Study is a type of stress test that uses PET or SPECT imaging of a patient's heart before and after exercise to determine the effect of physical stress on the flow of blood through the coronary arteries and the heart muscle.

The three-dimensional images produced by this study are called perfusion images because they show which areas of the heart muscle are perfused, or supplied, with blood.

This area of functional imaging within cardiology are specialist investigations and may only be requested by cardiologists or members of the cardiology team.

2 AIMS/ OBJECTIVES/ PURPOSE (including Related Trust Documents)

A physician may request/refer for a Stress/Rest MPI study to:

- assess the overall function of the heart muscle and the function of individual chamber walls
- assess damage to the heart muscle following a heart attack
- diagnose symptoms of coronary artery disease (CAD), such as shortness of breath or chest pain. Abnormal perfusion scans are highly indicative of CAD
- determine any narrowing of arteries that supply blood to the heart
- determine whether a patient is a candidate for revascularisation, a surgical procedure that restores blood flow
- manage the treatment of coronary artery disease by evaluating the results of:
 - revascularisation procedures
 - Medical or drug therapy.

3 ROLES AND RESPONSIBILITIES

The Cardiac Nurse:

- Prepare the medication, based on the pharmacy guidelines, for administration alongside the lead radiographer.
- During the procedure they must monitor the patient rhythm constantly and perform an ECG every 2 minutes.
- Check blood pressure every 2 minutes throughout the procedure.
- Time the procedure.
- Ensure patient is stable before discontinuing from all monitoring.
- Document any complication in patients notes

The lead Radiographer/radiographer

- Ensure procedure is explained to the patient and that they have capacity to consent. Consent for this procedure is via verbal consent.
- Ensure the correct amount of isotope is drawn up and administered to the patient; this is based on the patient's weight.
- Ensure there is no exclusion criteria met before proceeding.
- Cannulate the patient into preferably the ACF prior to procedure.
- Monitor patient's symptoms during procedure.
- Scan patient using gamma camera and ensure best quality images are achieved.
- Remove cannula before discharge home.
- Check patient's current medications and ensure there were no medications to be stopped and if there was that this has been done. This is also to be discussed with the Cardiac Nurse and the Lead Radiographer.
- Ensure the patients have not consumed any caffeine for 12 hours prior to procedure.
- Weigh patient
- Ask about asthma history and whether they have brought their inhalers.

4 GUIDELINE DETAILS (including Flowcharts)

EQUIPMENT REQUIRED FOR MYOVIEW SCANS

ECG Machine	To be collected from the ECG department	
GH Syringe Pump/IVAC	Available from x-ray	
Dynamap	Available from x-ray	
Venflons	Available from x-ray	
Octopus Bung	Available from x-ray	
50ml Luer Lock Syringe	Available from x-ray	
Administration Set For Pump	Available from x-ray	
Syringes/Needles	Available from x-ray	
ECG Monitoring/Electrodes	Available from x-ray	
Drugs	Adenosine 30mg/10ml	IV
	Aminophylline	IV
	Atropine	IV
	GTN Spray	SL
	Salbutamol	INH
	Sterile Water	IV
	Normal Saline	IV

Resus Trolley	Available from x-ray
Anaphylaxis Kit	Available from x-ray
Stop Watch	Available from x-ray

Procedure for the Administration of Adenosine

Adenosine concentration = 30mg/10ml (volume per patient is calculated as per the table in appendix 1).

Pharmacological Notes

Adenosine is a potent vasodilator in most vascular beds, except in renal afferent arterioles and hepatic veins where it is vasoconstrictor. The increase in coronary artery blood flow caused by Adenosine is significantly greater in normal coronary arteries than in stenotic arteries. At a dose rate of 0.14mg per kg per minute (140microgram/kg/min), the maximum coronary artery flow is achieved 2-3 minutes after the infusion. The typical haemodynamic response to infusion of Adenosine is a mild increase in heart rate, probably mediated by reflex response to peripheral vasodilatation, and a modest fall in systolic and diastolic blood pressure.

Indications

Patient having Myocardial Perfusion stress/rest studies who are unable to attain sufficient levels of cardiac stress by the usual methods and regimens of physical exercise.

Contra-indications (as outlined by The electronic Medicines Compendium: *Adenosine – Summary of Product Characteristics [SPC]*)

Adenosine is contra-indicated and exclusion criteria in patients suffering from:

- 1) Known hypersensitivity to adenosine
- 2) Second or third degree AV block, sick sinus syndrome, except in patients with a functioning artificial pacemaker
- 3) Long QT syndrome
- 4) Severe hypotension
- 5) Unstable angina not successfully stabilised with medical therapy
- 6) Decompensated states of heart failure
- 7) Concomitant use of dipyridamole

NB: In the SPC, it also states that chronic obstructive lung disease with evidence of bronchospasm (eg asthma bronchiale) is a contra-indication to Adenosine. However, the British Cardiac Society, the British Nuclear Cardiology Society and the British Nuclear Medicine Society (Anagnostopoulos *et al*, 2003) state that it is only contra-indicated in severe bronchospasm, and that patients with mild bronchospasm may still be stressed with Adenosine (Strauss *et al*, 2002).

The American Society of Nuclear Cardiology (ASNC 2016) suggests that:

“Patients with adequately controlled asthma can undergo an adenosine stress test and can have pre-treatment with 1 to 2 puffs of salbutamol or a comparable inhaler”.

In such cases that a consultant cardiologist has seen the patient and referred the patient for MPI, and a consultant radiologist has agreed to the procedure, it has been agreed with both parties to stress with Adenosine at the reduced rate of 0.07mg/kg/min for 1 minute, thereafter increasing to the full dose of 0.14mg/kg/min if no adverse effects are noted, again as recommended by the ASNC (2016). Such patients should bring their inhalers with them to the stress test and should self-administer the inhaler prior to the Adenosine infusion.

Equipment

A Graseby 3400 syringe pump driver is used to administer Adenosine. Full resuscitation equipment must be available, including full arrest drugs and Aminophylline. **ECG MONITORING** must be used.

Prescribing

Nuclear Medicine will normally hold, locked in the drug cupboard, 12 vials of Adenosine. On completion of the stress test, the cardiac nurse / radiographer must record the total dose given of Adenosine or any other drug in the patient's notes. This information must include the method of administration, the batch number and the manufacturer of the pharmaceutical. An Adenosine list is held in the drug cupboard, which must be updated as stock is used and received.

Radiographers will contact pharmacy to ensure stock is replenished.

At all times, the Cardiac Nurse/Radiographer must adhere to the local PGDs and must ensure they have been deemed competent to prescribe and administer the relevant drugs.

Administration

Full resuscitation equipment must be readily available.

Adenosine must only be administered by a Cardiac Nurse who has been signed off as competent in performing the stress test safely.

Before Adenosine is given, the Cardiac Nurse/Radiographer must have the dosage checked by the assisting Cardiac Nurse/Radiographer.

Adenosine should be administered as a continuous peripheral intravenous infusion at a rate of **0.07mg/kg/min for 1 minute, increasing to a rate of 0.14mg/kg/min for a further 5 minutes**, providing the patient has not experienced distressing side effects during the first minute at the reduced rate, using an infusion pump. This should be monitored continuously during the infusion. 12 lead ECG and BP (from opposite arm to infusion) should be recorded at 2 minute intervals, and for a minimum of 2 minutes after completion of the infusion, or until any adverse effects or ECG/BP changes have returned to the patient's norm.

Aminophylline must be available to counteract any serious side effects. The patient must be reviewed by cardiologist on-call if the nurse/radiographer is concerned, and the cardiologist on-call will decide whether Aminophylline is appropriate.

Aminophylline dose = 50 – 250mg IV by slow injection over 5-10 minutes at least 1 minute after injection of the tracer injection. Not Exceeding a rate of 25mg/Minute (Do not exceed 1ml/min)

NB – Amiophylline 250mg/10ml (Premade solution) (Do not exceed 1ml/min if using 250mg/10ml amps)

After 3 minutes of Adenosine infusion the radionuclide should be administered. The supervising cardiac nurse/radiographer (stress leader) must document all drugs in the patient's notes.

Adenosine should not be administered to pregnant or lactating mothers.

Adenosine is not recommended for use in children. Because it has the potential to cause significant hypotension, adenosine should be used with caution in patients with uncorrected hypovolaemia, stenotic valvular heart disease, pericarditis or pericardial effusion, autonomic dysfunction or stenotic carotid artery disease with cerebrovascular insufficiency. Infusion should be discontinued in any patient who develops persistent or symptomatic hypotension (SBP <90mmHg. Anagnostopoulos et al, 2003). Caution should be exercised in patients with unstable angina or recent myocardial infarction. The occurrence of severe Bradycardia should be taken as a warning of underlying conduction disease and should lead to treatment discontinuation. In patients with severe COPD, Adenosine may precipitate or aggravate bronchospasm.

Drug Interactions

1. The bradycardic response may be significantly exaggerated in patients treated with dipyridamole. If essential, it should be stopped at least 48 hours prior to adenosine infusion.
2. Methylxanthines (Aminophylline, Theophylline and Theobromine) should be stopped for 48 hours prior to infusion.
3. Caffeine (coffee, tea, chocolate, and cola) should be avoided for 12 hours prior to infusion.
4. Mexiletine increases the risk of Torsades de Pointes when given with Adenosine and so the two should not be given together.

Side Effects and Symptoms

Symptoms are very common (80%) with Adenosine infusion. They are, however, short lived as Adenosine has a very short biological half-life and halting the infusion rapidly dispels any side effects. Aminophylline may be required to terminate persistent side effects (50 – 250mg by slow intravenous infusion over 5 – 10 minutes)

IF:

1. Sustained 2nd or 3rd degree AV block occurs, stop infusion.
2. 1st degree AV block occurs, observe. 25% of cases progress to a higher degree of heart block.

5	EDUCATION AND TRAINING
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At least one member of the attending team should have completed the cardiac stress leader's course. The cardiac nurse must have adequate ECG knowledge and experience in working within cardiology for at least 2 years.

Cardiac nurses who are referring patients for MPI must have completed the E-IRMR training package.

6	MONITORING COMPLIANCE AND EFFECTIVENESS
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The waiting list times and the efficacy of the results will be monitored and should the need arise to increase capacity this will be expedited.

7 EQUALITY IMPACT ASSESSMENT

Name of service/policy/procedure being reviewed: Myocardial Perfusion Scanning Guideline

New or existing service/policy/procedure: Existing

Date of Assessment: 09/03/2022

For the service/policy/procedure and its implementation answer the questions a – c below against each characteristic (if relevant consider breaking the policy or implementation down into areas)

Protected Characteristic	a) Using data and supporting information, what issues, needs or barriers could the protected characteristic groups' experience? For example, are there any known health inequality or access issues to consider?	b) What is already in place in the policy or its implementation to address any inequalities or barriers to access including under representation at clinics, screening?	c) Please state any barriers that still need to be addressed and any proposed actions to eliminate inequality
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The area of policy or its implementation being assessed:

Race and Ethnicity:	None	None	None
Gender:	None	None	None
Age:	Over 18s only	None	None
Religion:	None	None	None
Disability:	None	None	None
Sexuality:	None	None	None
Pregnancy and Maternity:	Pregnant patients are excluded.	None	None
Gender Reassignment:	None	None	None
Marriage and Civil Partnership:	None	None	None
Socio-Economic Factors (i.e. living in a poorer neighbourhood / social deprivation):	None	None	None

What consultation with protected characteristic groups including patient groups have you carried out?

- None

What data or information did you use in support of this EqIA?

- Knowledge and experience

As far as you are aware are there any Human Rights issues be taken into account such as arising from surveys, questionnaires, comments, concerns, complaints or compliments?

- None

Level of impact

From the information provided above and following EqlA guidance document please indicate the perceived level of impact:

Low Level of Impact

For high or medium levels of impact, please forward a copy of this form to the HR Secretaries for inclusion at the next Diversity and Inclusivity meeting.

Name of Responsible Person undertaking this assessment: Helen Seston

Signature:

Date: 09/05/2025

[Appendix A](#) – Adenosine infusion rates table**Appendix A – Adenosine infusion rates table**

		1 st minute 0.07mg/kg/min		Remaining 5 minutes 0.14mg/kg/min	
Patient Weight, Kg	Infusion volume needed, ml	Infusion rate ml/min	Pump rate ml/hour	Infusion rate ml/min	Pump rate ml/hour
45-49	13	1.1	66	2.19	132
50-54	14	1.21	73	2.43	146
55-59	15	1.33	80	2.66	160
60-64	16	1.45	87	2.89	174
65-69	18	1.56	94	3.13	188
70-74	19	1.68	101	3.36	202
75-79	20	1.8	108	3.59	216
80-84	22	1.91	115	3.83	230
85-89	23	2.03	122	4.06	244
90-94	24	2.15	129	4.29	258
95-99	25	2.26	136	4.53	272
100-104	27	2.38	143	4.76	286
105-109	28	2.5	150	4.99	300
110-114	29	2.61	157	5.23	314
115-119	31	2.73	164	5.46	328
120-124	32	2.85	171	5.69	342
125-129	33	2.96	178	5.93	356
130-134	34	3.08	185	6.16	370
135-139	36	3.2	192	6.39	384

This table gives infusion rates for undiluted Adenosine (30mg/10ml) in line with the body weight (based on the nomogram in SPC)

Appendix B

Hyperlink to the Adenosine IV infusion PGD by registered Cardiac Nurse
Specialists/Radiographers for Myocardial perfusion imaging (MPI) stress testing

<https://sfhnet.nnotts.nhs.uk/Pharmacy-New/cmsbrowse.aspx?recid=2444&homeid=2443>