



## Introduction - What is EECP?

EECP is a non-invasive out-patient treatment for angina and heart failure utilised by several NHS centres for patients with ischaemic symptoms that are refractory to optimal tolerated medical treatment, recur post CABG or where the patient is too high-risk, unwilling, or not amenable for surgical intervention. It is funded by many PCT's on a named patient basis, and is reimbursed by most Private Health Insurers.

Over 120 clinical trials have been published in peer reviewed journals which show that approximately 80% of angina patients experience significant symptom relief and increased myocardial perfusion after a 35 hour course of EECP. This improvement in functional status may last three years or more and may enable patients to become more active and independent.

Published data is supported by outcomes within the NHS which show reduced chest pain frequency and severity, reduced GTN use, increased time to ST depression on exercise stress testing, increased quality of life assessment scores and significantly reduced cardiac admissions after a course of EECP.

## Physician's Guide to EECP

- What is EECP?
- How does it work?
- Mechanism of action?
- What benefits occur?
- Patient Selection
- Clinical Evidence
- Contraindications

-How to refer?

www.eecp.co.uk

## The Effect of EECP on circulation - how does it work?

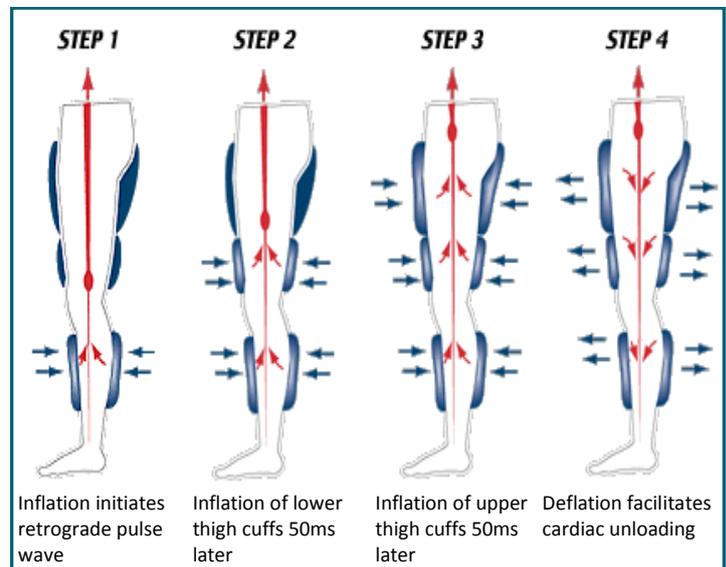
The diagram shows three blood pressure cuffs (blue areas) around the leg and buttock area, which inflate and deflate according to ECG analysis of the patient's cardiac cycle.

### Steps 1 – 3 (during the heart relaxation or diastolic phase)

Steps 1 to 3 show the rapid succession of contraction of the cuffs, squeezing first the calf, thigh then upper thigh cuffs in sequence, causing the reverse "counterpulsation" of oxygenated arterial blood back up to heart and coronary arteries during diastole. This augments myocardial perfusion which mainly occurs during this diastolic phase. Simultaneously, venous compression increases pre-load.

### Step 4 (during heart contraction or systolic phase)

Just before the next heart beat the cuffs simultaneously deflate, emptying the blood vessels. This significantly reduces peripheral vascular resistance and cardiac workload as the vascular beds are relatively empty when the cuffs are deflated.



Inflation initiates retrograde pulse wave  
 Inflation of lower thigh cuffs 50ms later  
 Inflation of upper thigh cuffs 50ms later  
 Deflation facilitates cardiac unloading

## Mechanism of Action - OVERVIEW

- Increased myocardial perfusion
- **Collateral blood vessel formation**
- Increased endothelial function and vasodilation:  
 ↑ nitric oxide, ↓ endothelin-1, ↓ BNP, ↑ VEGF
- Increased venous return
- Decreased systemic vascular resistance
- Increased cardiac output

These changes can be summarised as follows:

1. **Diastolic augmentation** -> increased coronary perfusion
2. **Systolic unloading** -> reduced cardiac workload and increased cardiac output

Studies have shown the haemodynamics of EECP closely resemble an intra-aortic balloon pump with a comparable level of diastolic augmentation. The retrograde arterial pressure wave increases coronary perfusion pressure, creating a gradient between ischaemic and non ischaemic areas which may promote latent conduits and collateral blood vessel formation.

## What benefits occur after EECP?

### Clinical investigations have demonstrated:

- Significantly prolonged time to ST depression on exercise stress testing
- Increased myocardial perfusion post EECP—demonstrated with various scan techniques:  
 Technetium scan, Cardiovascular MRI, stress ECHO

### Clinical studies show that people notice:

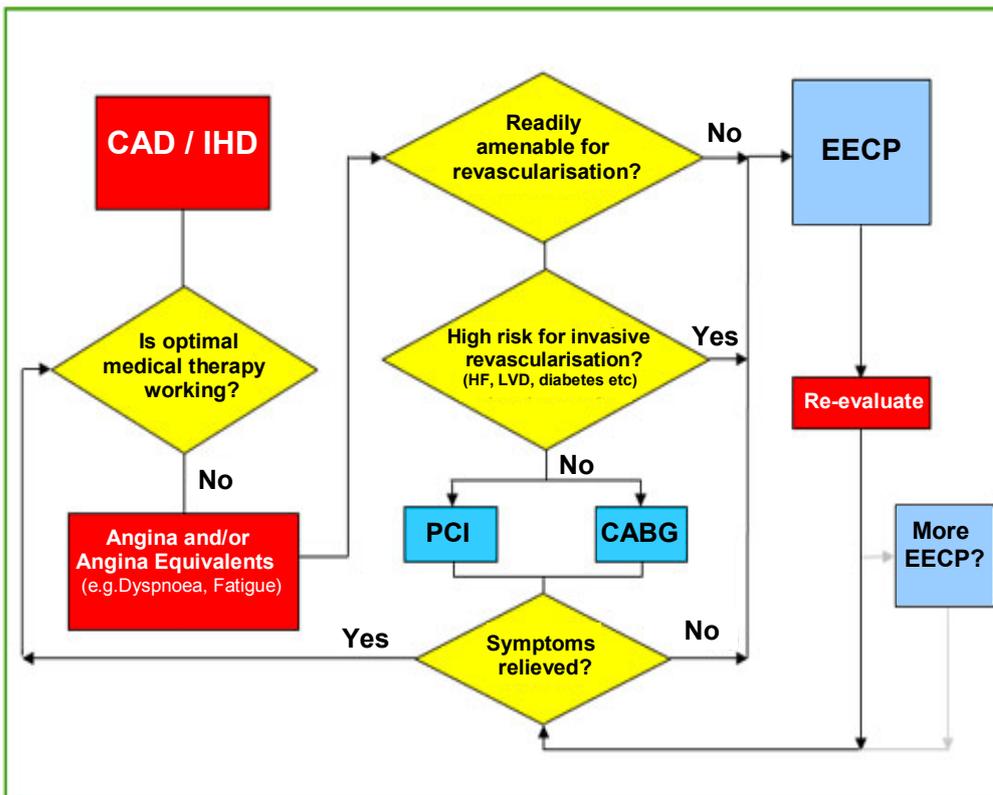
- Reduced frequency or complete elimination of angina symptoms.
- Increased ability to exercise free from chest pain and breathlessness.
- Decreased need for nitrate medication

## Patient Selection for EECP

All patients will be pre-assessed by the clinic and a Consultant Cardiologist for suitability for EECP prior to commencing treatment. Suitable patients include:

1. Patients with angina or angina equivalent symptoms who:
  - No longer respond to optimum medical therapy
  - Restrict activities to avoid symptoms
  - Are unwilling or not amenable for additional invasive revascularization procedures
  - Have euvoalaemic LV dysfunction (EF<40%), ischaemic cardiomyopathy
2. Have co-morbid conditions that increase the risk of revascularization procedures and post-op complications:  
e.g. Diabetes, heart failure, pulmonary disease, renal dysfunction
3. Elderly patients at high risk for morbidity/mortality from PCI/CABG

## EECP Clinical Treatment Flowchart



The MUST-EECP trial was a randomised, controlled, double-blinded study carried out at seven leading university hospitals in the United States. Patients in the active EECP therapy group demonstrated a statistically significant increase in time to exercise-induced ST segment depression when compared to sham and baseline, and reported a statistically significant decrease in the frequency of angina episodes when compared to sham and baseline.

**Multicenter Study of Enhanced External Counterpulsation (MUST-EECP: Effect of EECP on Exercise-Induced Myocardial Ischaemia and Anginal Episodes. The Journal of the American College of Cardiology, 33(7), 1833-1840**

Please see [www.eecp.co.uk](http://www.eecp.co.uk) for a more detailed review of EECP and evidence base

EECP has an extremely safe treatment profile. The clinic and consultant cardiologist will review contraindications and suitability for EECP

## Contraindications

- Arrhythmias that interfere with machine triggering (need rate controlling)
- Bleeding diathesis (INR must be < 2.5)
- Active thrombophlebitis
- Severe lower extremity peripheral vascular disease
- Presence of a documented aortic aneurysm requiring surgical repair
- Pregnancy

## Precautions

- BP > 180/110 mmHg should be controlled prior to treatment
- Heart rate of more than 120/min should be controlled prior to treatment
- Certain valve conditions, such as significant aortic regurgitation or severe mitral or aortic stenosis, may prevent the patient from obtaining benefit from diastolic augmentation

## How to refer?

We accept referrals from GP's, Cardiologists, and patient self-referrals and perform EECP for PCT and privately funded patients. We will arrange a free pre-assessment.

**Referrals & enquiries to:**

**The Dove Clinic**  
The Old Brewery  
High Street  
Twyford  
Winchester  
Hants, SO21 1RG

Tel: 01962 717060

Email: [secretaries@doveclinic.com](mailto:secretaries@doveclinic.com)



For further information regarding EECP please visit:

Web: [www.eecp.co.uk](http://www.eecp.co.uk)

Or for clinical enquiries please contact Dr Richard Fuller at The Dove Clinic.

Email: [richard.fuller@doveclinic.com](mailto:richard.fuller@doveclinic.com)

## Clinical Evidence

The International EECP Patient Registry (IEPR) has provided data on over 5,000 patients demonstrating therapeutic outcomes and duration of benefit.

Functional scores were graded using CCS angina score - classes I (mild) to IV (severe). Summary:

- after 24 months follow up 31% of patients recorded being angina free compared to 0% at the start of the study.
- 82% of patients improved after EECP by one or more CCS class
- 43.9% of patients improved after EECP by two or more CCS classes
- Benefits were sustained over the 24 month follow up