

EECP Improves Peripheral Artery Flow-Mediated Dilation in Patients with Chronic Angina: A Randomised Sham-Controlled Study

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Study Type	Randomised sham-controlled trial — first-ever RCT of EECP extracardiac effects
Subjects	42 symptomatic CAD patients; 28 EECP, 14 sham EECP (2:1 ratio)
PMID	20921442
Conflict of Interest	No conflicts declared
ACC Relevance	Landmark RCT demonstrating EECP's systemic anti-inflammatory and peripheral vascular rehabilitation effects directly applicable to injury rehab

Study Design

The first randomised sham-controlled investigation of EECP's extracardiac effects. 42 symptomatic CAD patients were randomised 2:1 to 35 one-hour sessions of either EECP (n=28) or sham EECP (n=14). Sham: cuffs applied but no compression. Blood samples and vascular ultrasound performed pre- and post-treatment.

Outcome Measures

Primary vascular	Flow-mediated dilation (FMD) of brachial and femoral arteries by ultrasound — gold standard peripheral endothelial function test
Vasoactive agents	Plasma nitrate/nitrite (NO production marker), 6-keto-PGF1 α , endothelin-1, asymmetrical dimethylarginine (ADMA)

Inflammation	TNF-alpha, monocyte chemoattractant protein-1 (MCP-1), soluble VCAM-1 (sVCAM-1), high-sensitivity CRP (hsCRP)
Oxidative stress	8-isoprostane (lipid peroxidation marker)

Key Results — Vascular Function

Outcome	EECP Group Change	Sham Group Change	p-value (EECP vs Sham)
Brachial artery FMD	+51%	+2%	p<0.01
Femoral artery FMD	+30%	+3%	p<0.01
Plasma NOx (nitric oxide)	+36%	+2%	p<0.01
6-keto-PGF1 α (prostacyclin)	+71%	+1%	p<0.01
Endothelin-1 (vasoconstrictor)	Decreased	Increased	p<0.05
ADMA (NO inhibitor)	Decreased	No change	p<0.05
8-isoprostane (oxidative stress)	Decreased	Increased	p<0.05

Key Results — Anti-Inflammatory Effects

Inflammatory Marker	EECP Group Change	Sham Group Change	p-value
TNF-alpha	6.1→5.0 pg/mL (-16%)	6.2→6.4 pg/mL (+3%)	p<0.01
hsCRP	3.4→2.3 mg/L (-32%)	3.4→3.5 mg/L (+3%)	p<0.05
MCP-1 (CCL2)	227→171 pg/mL (-13%)	230→231 pg/mL (+0.2%)	p<0.001
sVCAM-1	917→821 ng/mL (-6%)	955→967 ng/mL (+1%)	p<0.05

Physiological Significance

EECP creates significant increases in shear stimulus via pulsatile retrograde flow and antegrade flow in the femoral and brachial arteries. With a resting heart rate of 60 bpm, 35 one-hour sessions cause approximately 150,000 hyperaemic episodes across the vascular endothelium. The study demonstrates that EECP acts as a haemodynamic exercise simulator, generating the same endothelial shear stress and anti-inflammatory adaptations as regular aerobic exercise — but without requiring patient effort. This makes EECP uniquely valuable for injured, immobilised, or post-surgical patients who cannot exercise.

Conclusions

This landmark randomised sham-controlled trial provides Level II evidence that EECF significantly improves peripheral artery flow-mediated dilation, nitric oxide production, and systemic anti-inflammatory markers in symptomatic patients. The 51% brachial FMD improvement, 36% NO increase, and reductions in TNF-alpha (-16%), hsCRP (-32%), and MCP-1 (-13%) represent clinically meaningful anti-inflammatory and pro-vascular effects directly applicable to injury rehabilitation and post-injury oedema reduction.

Full Citation

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