

## Medical Policy Manual

**Topic:** Enhanced External Counterpulsation (EECP)

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**Section:** Medicine

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### IMPORTANT REMINDER

Medical Policies are developed to provide guidance for members and providers regarding coverage in accordance with contract terms. Benefit determinations are based in all cases on the applicable contract language. To the extent there may be any conflict between the Medical Policy and contract language, the contract language takes precedence.

PLEASE NOTE: Contracts exclude from coverage, among other things, services or procedures that are considered investigational or cosmetic. Providers may bill members for services or procedures that are considered investigational or cosmetic. Providers are encouraged to inform members before rendering such services that the members are likely to be financially responsible for the cost of these services.

### DESCRIPTION

Enhanced external counterpulsation (EECP) is a noninvasive, adjunct treatment that uses timed, sequential inflation of pressure cuffs on the legs and is primarily investigated as a treatment for chronic stable angina and heart failure (HF). Treatment is usually administered in 1- to 2-hour sessions, 5 days a week for 7 weeks, for a total of 35 hours of treatment. EECP has also been studied as a treatment for erectile dysfunction and ischemic stroke.

### Regulatory Status

A number of EECP devices have received 510(k) approval from the U.S. Food and Drug Administration (FDA).

### MEDICAL POLICY CRITERIA

Enhanced external counterpulsation is considered **investigational** for the treatment of all conditions, including but not limited to chronic stable angina pectoris, refractory angina pectoris, heart failure, ischemic stroke, and erectile dysfunction.

## SCIENTIFIC EVIDENCE

A number of non-randomized studies described experiences of EECP-treated patients.<sup>[1-21]</sup> Given the variable natural history of disorders such as angina and/or heart failure, the presence of many potential confounders of cardiac outcomes, and the potential for a placebo effect, observational data, including registry studies, are of limited utility in establishing efficacy of EECP.

Reliable randomized controlled trials (RCTs) that compare patients managed with versus without EECP and that report on relevant clinical outcomes (vs. intermediate or physiologic outcomes) are necessary in order to establish whether enhanced external counterpulsation (EECP) is efficacious and whether it is at least as good as alternative treatments.

### Literature Review

The focus of the literature review is on randomized controlled trials (RCTs) of EECP that report on relevant clinical outcomes. The current evidence is limited by the following:

- Few RCTs of EECP for chronic stable angina and heart failure (HF) have been published, and a majority of those trials report intermediate or physiologic outcomes rather than primary clinical outcomes. In addition, all published trials have significant methodological limitations, including but not limited to small study populations and limited and/or incomplete follow-up. Further, evidence for other indications (e.g. erectile dysfunction) is more limited than that for chronic stable angina and HF.
- It is uncertain whether true EECP offers additional benefit compared to sham treatment.
- It is uncertain whether EECP is as effective as standard treatment options which may include pharmacotherapy, exercise, or more invasive procedures such as percutaneous coronary intervention (PCI).

### Chronic Stable Angina

#### *Randomized Controlled Trials (RCTs) and Systematic Reviews*

A limited number of RCTs evaluated the effectiveness of EECP in the treatment of chronic stable angina pectoris.<sup>[22-27]</sup> In addition, a majority of these trials reported on intermediate or physiologic rather than clinical outcomes.<sup>[24-28]</sup> The one RCT that reported on changes in frequency of angina episodes and nitroglycerin use is summarized and appraised below:

Active EECP was compared to sham treatment in 139 patients with stable angina in the randomized, double-blinded Multicenter Study of Enhanced External Counterpulsation (MUST-EECP).<sup>[22,23,29,30]</sup> The study described changes in the following measures:

- Changes in the frequency of angina episodes and nitroglycerin (NTG) use
- Changes in exercise treadmill test (ETT) results as measured by exercise duration and time to  $\geq 1$ -mm ST-segment depression

Only the time to ST-segment depression changed significantly from baseline in the active EECp treatment group compared with the sham-treatment group, but the clinical significance of this 37-second improvement is unknown. In addition, several design flaws undermine the validity of the study findings:

- The sample size was too small to permit subset analyses, such as comparison of patients with different disease severity or different angina-related medical history. The small study population limits the ability to rule out the role of chance as an explanation of study findings.
- The active and sham treatment groups were significantly different at baseline, with longer angina duration, a higher proportion of patients with myocardial infarction (MI), and more residual vessel disease in the active EECp group, suggesting there may be a difference affecting the outcome.
- Patients were not followed-up beyond the 35-session treatment period that lasted up to 7 weeks, limiting conclusions on the durability of treatment effects.
- EECp was studied as an adjunct to pharmacotherapy. The participants self-reported the NTG use throughout the study. The recall bias in reporting of medication use may confound study findings.
- There was a large overall and differential loss to follow-up. Exercise duration data were only available for 87% and 79% of the patients in the sham and EECp groups respectively, potentially undermining randomization and comparability of treatment groups. Consequently, the treatment responses observed could have been confounded by differences in demographic, clinical or other characteristics between the groups.
- Intention-to-treat (ITT) analyses were reported only for the two outcomes of interest, angina count and nitroglycerin use.
- It is also noted that considerable exclusion criteria, such as exclusion of patients with Canadian Cardiovascular Society (CCS) class IV angina, limit the generalizability of study findings to all angina patients seen in clinical practice.
- A 12-month MUST-EECP follow-up study describes the effects of EECp on the patients' functioning and sense of well-being as measured by the Health-Related Quality of Life (HQOL) scale.<sup>[23,29,30]</sup> Although improvement in several quality of life scales were reported for the EECp-treated patients, only 71 (54%) of the original 139 subjects were included in this study. The findings from this follow-up could not be correlated to the treatment responses reported in the first study due to data limitations.

The 2010 Cochrane review<sup>[31]</sup> of EECp therapy for chronic stable or refractory stable angina pectoris also found the reliability of the findings from the MUST-EECP trial to be compromised due to:

- Poor methodological quality in terms of trial design and conduct
- Incomplete reporting of the review's primary outcome
- Limited follow-up for the secondary outcomes
- Flawed statistical analysis
- Limited generalizability of the study findings due to exclusion of patients with the most severe symptoms of chronic angina pectoris.

### Refractory Angina

No randomized controlled trials examined the effects of EECP in the treatment of refractory angina.

## Heart Failure (HF)

### *Randomized Controlled Trials*

One randomized controlled trial examined the effects of EECP in the treatment of heart failure.<sup>[29,30,32,33]</sup> The Prospective Evaluation of Enhanced External Counterpulsation in Congestive Heart Failure (PEECH) study randomized 187 patients with mild or moderate heart failure to receive either EECP treatment in addition to optimal pharmacotherapy, or pharmacotherapy alone. The study evaluated changes in:

- Exercise duration (% patients with increase  $\geq 60$  seconds on treadmill, absolute change (seconds))
- Peak volume of oxygen uptake ( $V_{O_2}$ ) (% patients with increase  $\geq 1.25$  ml/min/kg)
- Quality of life measures (SF-36 and Minnesota Living with Heart Failure Questionnaire)
- New York Heart Association (NYHA) functional classification status

Although the study reports improved exercise tolerance and NYHA functional classification in EECP-treated patients, several design flaws undermine the reliability of the study findings:

- The loss to follow-up was disproportionately large for the EECP compared to the control group (27% and 13.8% respectively), suggesting that there may be a difference that affects the outcome.
- Due to the nature of the comparison treatment, the patients undergoing EECP could not be blinded, increasing likelihood of the placebo effect.
- The randomization scheme was not explained. Inadequate randomization may result in unequal distribution of potential confounders, undermining the validity of study findings.
- The short follow-up period (6 months) limits conclusions regarding the durability of treatment effects.
- It is noted that substantial exclusion criteria, such as exclusion of NYHA functional class III and IV, limit the generalizability of study findings to the general population of patients with heart failure who are seen in clinical practice
- In addition, the clinical significance of the  $\geq 60$ s exercise duration increase is not clear.
- Finally, the magnitude of increase in NYHA classification was not reported, only the percent of patients with an increase.

Subsequent analysis of the PEECH participants over 65 years of age demonstrated statistically significant changes of both exercise duration and peak oxygen consumption.<sup>[34]</sup> Again, the clinical significance of these findings is not clear. In addition, the study was not sufficiently powered for this type of sub-analysis.

## Other Conditions

EECP has been investigated as a treatment for a few indications other than heart disease, including but not limited to ischemic stroke and erectile dysfunction.<sup>[35-40]</sup> However, the EECP literature for these indications is very limited in quantity and quality, and the treatment benefit cannot be reliably established.

### Clinical Practice Guidelines

American College of Cardiology (ACC)/American Heart Association (AHA)/American College of Physicians (ACP)/American Association for Thoracic Surgery (AATS)/Preventive Cardiovascular Nurses Association (PCNA)/Society for Cardiovascular Angiography and Interventions (SCAI)/Society of Thoracic Surgeons (STS)<sup>[41]</sup>

The 2012 collaborative guidelines on the management of patients with stable ischemic heart disease and stable angina indicate EECP “may be considered for relief of refractory angina.” This recommendation is based on Class IIb, Level of Evidence: B which indicates the efficacy of the intervention isn’t well established and further studies would be helpful.

### Summary

The evidence is insufficient to permit conclusions regarding the benefits of enhanced external counterpulsation (EECP) as a treatment for any condition, including but not limited to chronic stable angina, refractory angina, or heart failure. There is no reliable, long-term evidence from well-designed, randomized controlled trials on the effectiveness of EECP as a treatment of any condition; therefore, EECP is considered **investigational** for all indications.

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## CROSS REFERENCES

None

CODES	NUMBER	DESCRIPTION
CPT	92971	Cardioassist method of circulatory assist; external
HCPCS	G0166	External counterpulsation, per treatment session