



EVIDENCED-BASED CARDIOLOGY

Cochrane Corner: Intra-aortic balloon pump in patients with cardiogenic shock following myocardial infarction[☆]



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KEYWORDS

Cardiogenic shock;
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device

Abstract Improvement of hemodynamic parameters is the rationale for the use of intra-aortic balloon pump counterpulsation (IABP) in patients with cardiogenic shock following acute myocardial infarction (MI). This Cochrane systematic review evaluated the impact of this intervention in reducing mortality. Seven randomized controlled trials with a total of 790 patients were included (four using medical therapy as a comparator, and three comparing IABP with other ventricular assist devices). IABP did not reduce mortality in either the short or long term. Therefore, the systematic use of IABP in patients with cardiogenic shock following MI cannot be recommended.

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PALAVRAS-CHAVE

Choque cardiogénico;
Enfarte agudo do
miocárdio;
Balão intra-aórtico;
Dispositivo de
assistência
ventricular

Cochrane Corner: uso do balão intra-aórtico em doentes com enfarte agudo do miocárdio complicado com choque cardiogénico

Resumo A melhoria de parâmetros hemodinâmicos justifica o uso do balão intra-aórtico (BIA) em doentes com enfarte agudo do miocárdio (EAM) complicado por choque cardiogénico. Esta revisão sistemática da *Cochrane* avaliou o potencial impacto desta intervenção na mortalidade. Foram avaliados sete ensaios clínicos aleatorizados e controlados com um total de 790 doentes

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(quatro estudos utilizando a terapêutica médica como comparador e três estudos compararam o BIA com outros dispositivos de assistência ventricular). O uso de BIA não reduziu significativamente a mortalidade a curto ou a longo prazo nos doentes com EAM e choque cardiogénico. Não existe evidência que suporte o seu uso sistemático nestes doentes.

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Unverzagt S, Buerke M, de Waha A, Haerting J, Pietzner D, Seyfarth M, Thiele H, Werdan K, Zeymer U, Prondzinsky R. Intra-aortic balloon pump counterpulsation (IABP) for myocardial infarction complicated by cardiogenic shock. *Cochrane Database of Systematic Reviews* 2015, Issue 3. Art. No.: CD007398. doi:10.1002/14651858.CD007398.pub3.

Clinical question

What is the impact of intra-aortic balloon pump counterpulsation (IABP) in patients with cardiogenic shock following acute myocardial infarction (MI)?

Objectives

To evaluate the efficacy and safety of IABP versus non-IABP treatment in patients with MI complicated by cardiogenic shock.

Description of review

A systematic review was performed of all randomized controlled trials (RCTs) of patients with MI complicated by cardiogenic shock¹ that assessed the use of IABP compared to non-IABP treatment including other ventricular assist devices.

Searches of the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EMBASE, LILACS, IndMed, KoreaMed, and registers of ongoing trials were performed in October 2013.

Data were pooled in meta-analyses. Hazard ratios (HR) with 95% confidence intervals (CI) were used to express time-related variables such as time to event and dichotomous variables were expressed as odds ratios (OR) with 95% CI.

Results

Seven trials were included, with a total of 790 patients (406 in the intervention groups and 384 in the control groups). Four trials compared IABP to standard therapy and

three to other left ventricular assist devices (two with the TandemHeart® and one with the Impella®).

None of the trials were blinded to treatment allocation. All patients were revascularized, 95% by primary angioplasty and 5% by fibrinolysis. Mean time of IABP support was 59 hours.

The proportion of fatal events at 30 days was around 40%. Aggregate analysis of the trials provided no evidence for a beneficial effect of IABP on mortality 30 days after the index event (HR 0.95; 95% CI 0.76–1.19) (Figure 1). Six-month mortality was also similar to other treatment strategies (OR 0.96; 95% CI 0.71–1.30).

During hospitalization, 15 (4.12%) out of 364 patients from the intervention groups suffered severe adverse events (reinfarction or stroke), compared to five (1.38%) out of 363 from the control groups.

Conclusions

Available evidence, based on RCTs, does not support the systematic use of IABP in patients with cardiogenic shock secondary to MI to improve survival.

Comment

Cardiogenic shock is a complication of MI in 5–7% of cases and is associated with high mortality.² There is little evidence concerning treatment of this extremely serious condition; only coronary revascularization has been shown to reduce mortality significantly at six months.³

The physiological basis for inflation of an IABP in the thoracic aorta in diastole is that it will improve certain hemodynamic parameters that affect prognosis, particularly by enhancing coronary flow, reducing afterload and increasing the cardiac index. As with any medical intervention, its systematic use must be based on methodologically robust studies. In this review, IABP did not reduce mortality in either the short or long term in the pooled analysis of RCTs.^{1,4} With regard to the adverse events most often associated with IABP (stroke, peripheral ischemic vascular complications, bleeding and sepsis), the most robust study (IABP-SHOCK II) showed no significant differences between IABP and medical therapy.⁵

It should be borne in mind that the overall assessment of the impact of IABP in this systematic review is limited by certain factors, including the lack of blinding to treatment

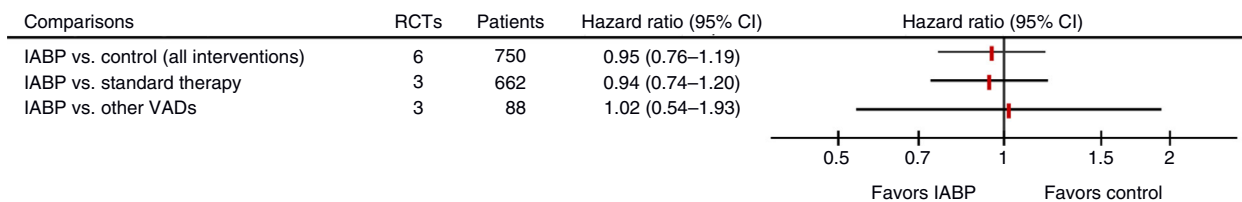


Figure 1 30-day mortality with IABP (adapted from Unverzagt et al.¹). CI: confidence interval; HR: hazard ratio; IABP: intra-aortic balloon pump counterpulsation; RCTs: randomized controlled trials; VADs: ventricular assist devices.

allocation, the inclusion of trials with small study populations and high crossover rates, and the inclusion of patients with IABP at randomization.

Clinical implications

The European Society of Cardiology guidelines for the management of MI with ST-segment elevation state that IABP may be considered (class of recommendation IIb, level of evidence B) in patients with MI complicated by cardiogenic shock, while other ventricular assist devices have the same class of recommendation (IIb) but a lower level of evidence (C).⁶

The American College of Cardiology Foundation/American Heart Association guidelines for the management of heart failure give class of recommendation IIa, level of evidence B, for ventricular assist devices in patients with MI and cardiogenic shock refractory to medical therapy.⁷

IABP thus has only a secondary role in the treatment of MI-related cardiogenic shock, and its routine use is not recommended, since the intervention does not lead to clear benefits.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

- Unverzagt S, Buerke M, de Waha A, et al. Intra-aortic balloon pump counterpulsation (IABP) for myocardial infarction complicated by cardiogenic shock. *Cochrane Database Syst Rev.* 2015;3:CD007398.
- Goldberg RJ, Spencer FA, Gore JM, et al. Thirty-year trends (1975 to 2005) in the magnitude of, management of, and hospital death rates associated with cardiogenic shock in patients with acute myocardial infarction: a population-based perspective. *Circulation.* 2009;119:1211–9.
- Hochman JS, Sleeper LA, Webb JG, et al. Early revascularization in acute myocardial infarction complicated by cardiogenic shock. SHOCK Investigators. Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock. *N Engl J Med.* 1999;341:625–34.
- Thiele H, Zeymer U, Neumann FJ, et al. Intraaortic balloon pump in cardiogenic shock II (IABP-SHOCK II) trial investigators. Intra-aortic balloon counterpulsation in acute myocardial infarction complicated by cardiogenic shock (IABP-SHOCK II): final 12 month results of a randomised, open-label trial. *Lancet.* 2013;382:1638–45.
- Thiele H, Zeymer U, Neumann FJ, et al., IABP-SHOCK II Trial Investigators. Intraaortic balloon support for myocardial infarction with cardiogenic shock. *N Engl J Med.* 2012;367:1287–96.
- Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC) Steg PG, James SK, Atar D, et al. ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Eur Heart J.* 2012;33:2569–619.
- Yancy CW, Jessup M, Bozkurt B, et al., American College of Cardiology Foundation; American Heart Association Task Force on Practice Guidelines. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2013;62:e147–239.