

Oxygen therapy for acute myocardial infarction: A systematic review and meta-analysis



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ABSTRACT

Background: Potential benefits or risks of oxygen inhalation for patients with acute myocardial infarction are not fully understood.

Objective: We performed this study to systematically assess the effectiveness and safety of oxygen therapy for patients with acute myocardial infarction.

Design: A systematic review and meta-analysis.

Data sources: We searched randomized controlled trials systematically in PubMed, EMBASE, Web of Science and Cochrane Library up to June 2016.

Review methods: Randomized controlled trials that estimated the effectiveness and safety of oxygen therapy for patients with acute myocardial infarction were identified by two independent reviewers. The primary outcomes were short-term mortality and recurrent rate of myocardial infarction, and the secondary outcomes were arrhythmia incidence and pain incidence. Relative risks (RRs) and 95% confidence intervals (CIs) were used to measure the pooled data.

Results: A total of five randomized controlled trials were in accordance with inclusion criteria and were included in this meta-analysis. Compared with no oxygen group, the oxygen group did not significantly reduce short-term death (RR: 1.08, 95%CI: 0.31–3.74), and there was moderate heterogeneity ($I^2 = 50.8\%$, $P < 0.107$) among studies. We found a significant increase in the rate of recurrent myocardial infarction (RR: 6.73, 95%CI: 1.80–25.17, $I^2 = 0.0\%$, $P = 0.598$) in the oxygen group. The oxygen group did not have a significant reduction in arrhythmia (RR: 1.12, 95%CI: 0.91–1.36; $I^2 = 46.2\%$, $P < 0.156$) or pain (RR: 0.97, 95%CI: 0.91–1.04; $I^2 = 7.2\%$, $P = 0.340$).

Conclusions: Oxygen inhalation did not benefit patients with acute myocardial infarction with normal oxygen saturation. It may increase the rate of recurrent myocardial infarction. High quality trials with larger sample sizes are required.

What is already known about the topic?

- Oxygen therapy has commonly been used in the initial treatment for patients with acute myocardial infarction, while potential benefits or risks of oxygen therapy for these patients remain inconclusive.
- Previous research has not shown consistent results, and some studies identified adverse outcomes such as increased myocardial injury for supplemental oxygen administration during acute myocardial infarction.

What this paper adds

- Oxygen therapy can neither significantly reduce in-hospital mortality, nor reduce the rate of arrhythmia and pain.
- Oxygen inhalation does benefit patients with acute myocardial infarction with normal oxygen saturation.

1. Introduction

Oxygen therapy has become a treatment for patients with acute myocardial infarction for more than 100 years (Steele, 1900). Some

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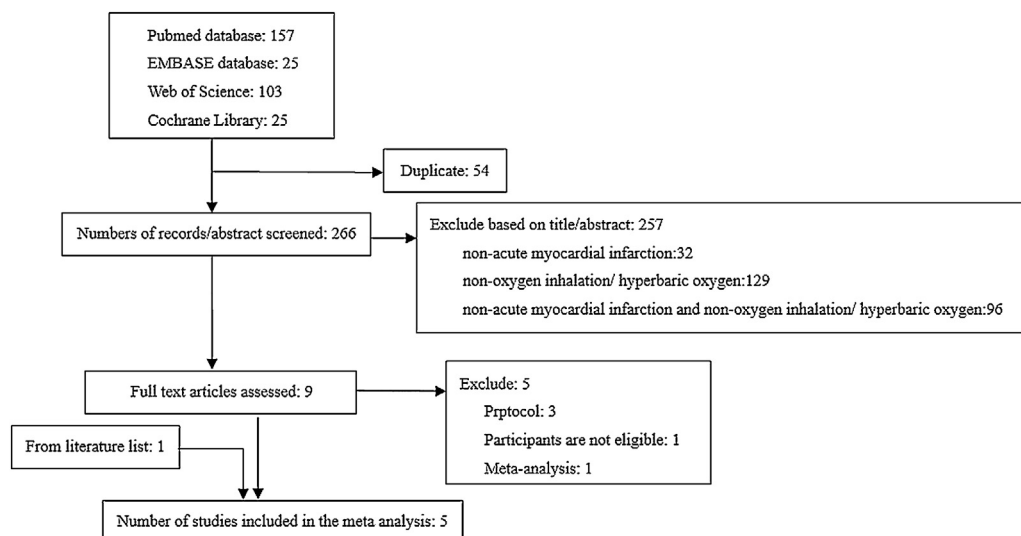


Fig. 1. The flow diagram of literature review process.

studies indicated that oxygen therapy may increase oxygen delivery to ischemic myocardium and hence reduce myocardial injury (Maroko et al., 1975; Kelly et al., 1995). In addition, more than 90% of patients with acute myocardial infarction received oxygen therapy in a clinical context (Beasley et al., 2007). However, potential benefits or risks of oxygen therapy for patients with acute myocardial infarction remain inconclusive. Some studies found no clear benefits or risks that oxygen therapy brings for patients with acute myocardial infarction (David et al., 2013; Rawles and Kenmure, 1976), other studies found that oxygen therapy may lead to harm (Kenmure et al., 1968; Dion et al., 2015). A systematic review and meta-analysis (Cabello et al., 2013) did not report a clear conclusion. Furthermore, one recent study (Dion et al., 2015) identified some new evidence that oxygen therapy could increase the rate of recurrent myocardial infarction and arrhythmia. Therefore, we performed this meta-analysis of the latest and most convincing evidence to systematically assess the effectiveness and safety of oxygen therapy for patients with acute myocardial infarction.

2. Methods

2.1. Literature search and study selection

This study was conducted following the Cochrane Collaboration and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (Moher et al., 2009; Higgins and Green, 2011). We searched relevant articles in PubMed, EMBASE, Cochrane Library and Web of Science for randomized controlled trials (RCTs) that estimated the effectiveness and safety of oxygen therapy for patients with acute myocardial infarction until June 2016. Search strategy included following terms “acute myocardial infarction”, “oxygen therapy” and “randomized controlled trial” (an example of specific strategy is shown in supplementary material: Table S1). Titles and abstracts of the retrieved records were read, and some clearly irrelevant studies were excluded. Full texts of all remaining articles were read to determine eligible studies. Reference lists of identified trials and review articles were also hand screened to identify any additional relevant studies.

Studies satisfying the following criteria were included: (1) design: randomized and quasi-randomized controlled clinical trials; (2) population: patients with acute myocardial infarction less than 24 h; (3) intervention: oxygen inhalation at normal pressure, regardless of the oxygen flow rate (patients receiving home oxygen were not included); (4) data: adequate information was provided to calculate the relative risk (RR) and the corresponding 95% confidence interval (CI). There is no any language limitation.

2.2. Data extraction and outcome

We extracted data from each included study and put them into a data-extraction sheet. The following data were collected: the first author, year of publication, country of origin, the number of patients, intervention, control, outcomes data (short-term death, recurrent myocardial infarction, arrhythmia and pain) and follow up. We contacted the corresponding authors to request the data that need to be clarified or not be presented in the publication. The primary outcomes were short-term mortality (in-hospital mortality) and the rate of recurrent myocardial infarction. The recurrent myocardial infarction was measured at hospital: patients with typical clinical symptoms and signs of acute myocardial infarction (chest pains, pathological Q wave and serum levels change of cardiac markers), and previous medical history of acute myocardial infarction. Secondary outcomes included arrhythmia and pain.

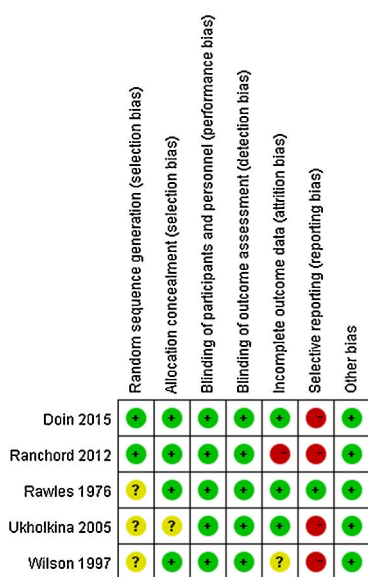


Fig. 2. The result of risk of bias assessment: each risk of bias item for included studies (green means low risk of bias, yellow means unclear risk of bias, red means high risk of bias). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

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