

Oxygen Therapy in Patients with Acute Myocardial Infarction: A Systemic Review and Meta-Analysis

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ABSTRACT

OBJECTIVE: Oxygen therapy is frequently used for patients with acute myocardial infarction. The aim of this study is to perform a systematic review and meta-analysis to compare the outcomes of oxygen therapy versus no oxygen therapy in post-acute myocardial infarction settings.

METHODS: A systematic search of electronic databases was conducted for randomized studies, which reported cardiovascular events in oxygen versus no oxygen therapy. The evaluated outcomes were all-cause mortality, recurrent coronary events (ischemia or myocardial infarction), heart failure, and arrhythmias. Summary-adjusted risk ratios (RRs) were calculated by the random effects DerSimonian and Laird model. The risk of bias of the included studies was assessed by Cochrane scale.

RESULTS: Our meta-analysis included a total of 7 studies with 3842 patients who received oxygen therapy and 3860 patients without oxygen therapy. Oxygen therapy did not decrease the risk of all-cause mortality (pooled RR, 0.99; 95% confidence interval [CI], 0.81-1.21; $P = .43$), recurrent ischemia or myocardial infarction (pooled RR, 1.19; 95% CI, 0.95-1.48; $P = .75$), heart failure (pooled RR, 0.94; 95% CI, 0.61-1.45; $P = .348$), and occurrence of arrhythmia events (pooled RR, 1.01; 95% CI, 0.85-1.2; $P = .233$) compared with the no oxygen arm.

CONCLUSIONS: This meta-analysis confirms the lack of benefit of routine oxygen therapy in patients with acute myocardial infarction with normal oxygen saturation levels.

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KEYWORDS: Coronary artery disease; Myocardial infarction; Oxygen

INTRODUCTION

Ischemic heart disease is the most common cause of death worldwide.¹ Furthermore, acute myocardial infarctions occur in approximately 790,000 Americans every year.² Reperfusion

therapy is the gold standard treatment strategy for patients who present with acute myocardial infarction.¹ Other treatment therapies, such as routine oxygen therapy, have been evaluated to determine their impact on cardiovascular outcomes. Oxygen therapy in ischemic heart disease was first reported in 1900 and since that time has been incorporated in the usual care during acute treatment for patients with acute myocardial infarction.² Previous animal and clinical studies hypothesized that supplemental oxygen up to even hyperoxic levels in patients with acute myocardial infarction would reduce myocardial injury by increasing oxygen delivery to ischemic myocardium.³⁻⁵ Yet, those studies were not randomized or blinded. Conversely, it has since been reported that hyperoxia may precipitate an increase in myocardial injury

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due to coronary vasoconstriction and oxidative stress.^{6,7} Yet the use of supplemental oxygen continued to be a routine practice in patients with cardiac disease. More important, no randomized, blinded, and controlled studies have shown an advantage in normoxemic patients, with surging evidence proving the conceivable adverse effects of hyperoxia in acute myocardial infarction.^{8,9} A Cochrane report from 2016 did not show any benefit to using oxygen in patients with acute myocardial infarction.⁸ Additionally, a recent meta-analysis reviewed 5 randomized controlled trials and concluded that oxygen supplementation did not benefit patients with baseline normal peripheral oxygen saturations $\geq 90\%$.⁹

Most recently, a registry-based randomized clinical trial was performed to evaluate oxygen therapy on all-cause mortality at 1 year (The Determination of the Role of Oxygen in Suspected Acute Myocardial Infarction),¹⁰ which showed that routine supplemental oxygen in patients without hypoxemia at baseline undergoing hospitalization for acute myocardial infarction did not have a reduced 1-year all-cause mortality. This study provides definitive evidence that supplemental oxygen is not beneficial in patients who have normal baseline oxygen saturations with acute myocardial infarction.¹¹ In this context, we performed an updated meta-analysis with the most updated evidence to evaluate the efficacy of routine oxygen supplementation in patients with acute myocardial infarction.

METHODS

Data Sources

An electronic search of the MEDLINE, Web of Science, and Cochrane Collaboration of Clinical Trials was performed from inception to November 2017 without language restriction, using the keywords “acute myocardial infarction,” “oxygen therapy,” “assessment,” and “outcomes,” as illustrated in **Figure 1**. Bibliographies of the included studies, relevant review articles, and meta-analyses were manually searched for any potential overlooked studies. The major cardiovascular conferences and proceedings, for example, American College of Cardiology and American Heart Association conferences, were screened for any abstracts addressing this topic.

Selection Criteria and Data Extraction

Randomized controlled studies and observational studies evaluating cardiovascular outcomes in adult subjects with acute myocardial infarction and oxygen therapy with no hypoxemia were included. We required that the studies had reported outcomes in both an oxygen therapy arm and no oxygen arm (control) to be included. If a studied population reported more than 1 publication, the outcomes were preferentially reported at the longest follow-up duration. Data were extracted by 2 independent groups and revised by AA and AE for accuracy.

CLINICAL SIGNIFICANCE

- Society guidelines endorse oxygen therapy for the management of patients with acute myocardial infarction in the context of hypoxemia.
- The study revealed the lack of benefit of routine oxygen therapy in patients with acute myocardial infarction with normal oxygen saturation levels.
- The value of the present study is to resolve the debate of routine oxygen use in the setting of acute myocardial infarction with no hypoxia with the most updated evidence, including randomized trials.

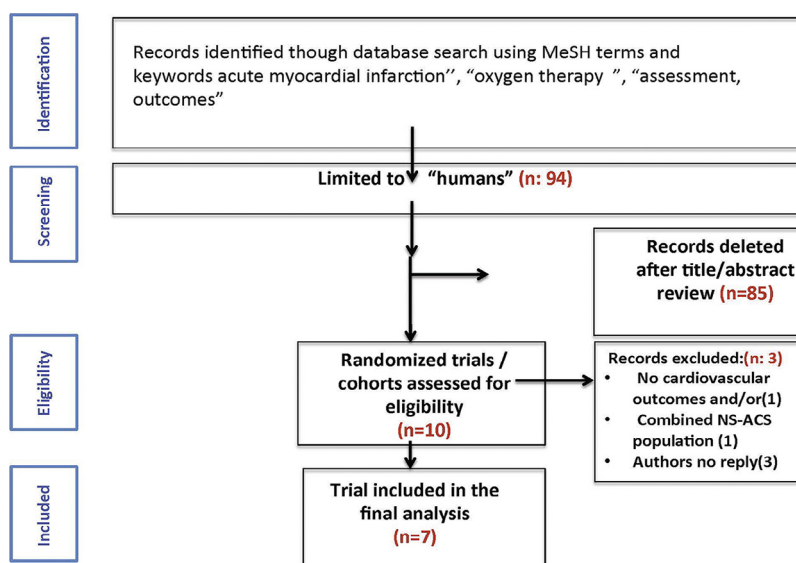


Figure 1 Summary of how the systematic search was conducted and eligible studies were identified (PRISMA flow diagram). NS-ACS = non ST elevation-Acute Coronary Syndrome.

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