TAKE-HOME MESSAGE

Oxygen therapy does not reduce the risk of all-cause mortality, recurrent ischemia or myocardial infarction, heart failure, or arrhythmias compared with no supplemental oxygen therapy for patients with acute myocardial infarction and normal oxygen saturation.

In Patients With Acute Myocardial Infarction and No Hypoxemia, Does Oxygen Therapy Improve Outcomes Compared With No Supplemental Oxygen?

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METHODS

DATA SOURCES

Authors performed a systematic review and meta-analysis according to the *Cochrane Handbook for Systematic Reviews of Interventions* and Preferred Reporting Items for Systematic Reviews and Meta-analyses statements. Investigators searched MEDLINE, Web of Science, and Cochrane Collaboration of Clinical Trials, with no language restrictions. Authors searched reference lists of included studies, review articles, meta-analyses, and cardiovascular conferences and proceedings for other relevant studies.

STUDY SELECTION

Authors included randomized controlled trials and observational studies evaluating outcomes in adults with acute myocardial infarction and no hypoxemia (definition dependent on individual study). Investigators included studies only if authors reported outcomes for patients in both the oxygen therapy arm and no oxygen therapy arm.

DATA EXTRACTION AND SYNTHESIS

Two investigators independently extracted data from included studies. Primary outcomes included all-cause mortality, recurrent ischemia or myocardial infarction,

Results

Results of included trials.

Outcome	Relative Risk (95% CI)	Total Events		Heterogeneity (I^2), %
		Oxygen Group	Control Group	
All-cause mortality	0.99 (0.81–1.21)	188/3,820	189/3,840	0
Recurrent ischemia/MI	1.19 (0.95–1.48)	160/3,723	138/3,757	0
Heart failure	0.94 (0.61–1.45)	49/3,415	53/3,446	5.3
Arrhythmia	1.01 (0.85–1.20)	322/3,789	323/3,793	28.3

CI, Confidence interval; *MI*, myocardial infarction.

Authors included 7 randomized controlled trials with 3,842 patients receiving oxygen therapy and 3,860 patients not receiving supplemental oxygen. Time frames for outcome measurements ranged from index admission up to 12 months. Most included patients were men, and the most common comorbidities were hypertension, hyperlipidemia, diabetes, and smoking. Overall, there was no association between oxygen supplementation with any benefit in patients with acute myocardial infarction (Table). Six studies reported all-cause mortality, 6 reported recurrent ischemia or myocardial infarction, 3 reported heart failure, and 5 reported arrhythmia. Studies varied in quality, with no studies powered to detect a difference in clinically significant adverse cardiac events. Definition of hypoxemia differed among studies, including saturations less than 90%, 92%, or 94%. Three studies were unclear for selection bias, 4 demonstrated attrition bias, and 3 demonstrated reporting bias, with 1 study unclear for reporting bias. Risk of bias, inconsistency, indirectness, and imprecision were not serious in regard to certainty assessment for meta-analysis outcomes.

heart failure, and arrhythmia, which authors assessed with intention-to-treat analysis. Authors calculated random-effects summary risk ratios with 95% confidence intervals with DerSimonian and Laird models; they used a fixed-effect model for secondary analysis. Investigators assessed heterogeneity with I^2 and publication bias with Egger's method. Authors assessed evidence quality with the Cochrane tool for individual studies and the Grading of Recommendations Assessment, Development and Evaluation tool for evaluating overall evidence quality of each outcome.

Commentary

Acute myocardial infarction is a major cause of death worldwide, with reperfusion the criterion standard therapy.[1,2] Other treatments, including aspirin, anticoagulation, and oxygen therapy, are often used for supplemental treatment.[1,3] Emergency physicians previously used oxygen as a routine treatment in acute myocardial infarction, with the supposition that administration of oxygen to produce hyperoxic levels could reduce myocardial injury.[4-6] Previous American College of Cardiology/American Heart Association guidelines for ST-segment elevation myocardial infarction (STEMI) stated that oxygen supplementation in patients with STEMI within the first 6 hours was reasonable (class IIa, level C evidence).[3] However, hyperoxia may increase myocardial injury with oxidative stress and coronary vasoconstriction. A Cochrane review suggested no benefit for oxygen in patients with acute myocardial infarction,[7] and another meta-analysis concluded that there was no association between supplemental oxygen with improved outcomes in patients without hypoxemia.[8]

This meta-analysis sought to evaluate the use of routine oxygen supplementation in patients with acute myocardial infarction and no hypoxemia with the most up-to-date literature. The results suggest supplemental oxygen does not decrease short-term mortality, arrhythmias, heart failure, or recurrent ischemia in patients with normal oxygen saturation and acute myocardial infarction. This meta-analysis included a larger sample of 7,702 patients, with previous analyses including 1,173 and 921 patients, and longer follow-up (up to 12 months).[7,8] This current meta-analysis suggests similar outcomes compared with those of other publications and patient populations.[9,10] Although this meta-analysis suggests no benefit to supplemental oxygen, its authors were unable to comment on a harmful effect of oxygen supplementation. Despite the previous 2004 American College of Cardiology/American Heart Association guideline for STEMI that stated that oxygen supplementation in patients with STEMI within the first 6 hours was reasonable, subsequent guidelines reserve oxygen therapy for patients who are hypoxemic (oxygen saturation <90%).[3,11,12]

Limitations of this meta-analysis include various quality of included studies, with only one study double-blinded and several with incomplete follow-up. Definitions of hypoxemia differed among studies, which adds to the heterogeneity. None of the included studies had sufficient power to detect a difference in adverse cardiac events, and most of the included studies evaluated patients with STEMI, limiting generalizability to patients with non-STEMI and unstable angina.

This meta-analysis suggests no benefit to oxygen supplementation for patients with acute myocardial infarction and normal oxygen saturations. Further studies are necessary to evaluate for potential harm.

Editor's Note: This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshot (SRS) series. The source for this systematic review snapshot is: **Abuzaid A, Fabrizio C, Felpel K, et al. Oxygen therapy in patients with acute myocardial infarction: a systemic review and meta-analysis. *Am J Med*. 2018; https://doi.org/10.1016/j.amjmed.2017.12.027.**

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Michael Brown, MD, MSc, Jestin N. Carlson, MD, MS, and Alan Jones, MD, serve as editors of the SRS series.

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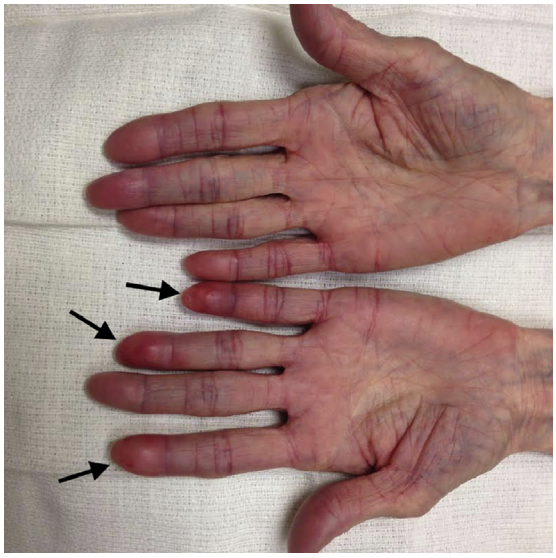

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