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COCHRANE CORNER

Oxygen therapy for acute myocardial infarction

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Clinical Question: Does the routine use of inhaled oxygen in acute myocardial infarction (AMI) improve patient outcomes, in particular pain and death?

Context: Coronary heart disease is an important cause of death worldwide. In the United Kingdom and the United States it accounts for about one third of all deaths in people aged 35 years or over. The most serious complications of AMI are cardiogenic shock, heart failure, ventricular fibrillation and recurrent ischaemia.

The cornerstone of contemporary management of patients with AMI presenting with ST-segment elevation is reperfusion therapy, with either primary percutaneous coronary intervention or thrombolytic treatment, if less than 12 hours has elapsed from the onset of symptoms. Most guidelines for the treatment of people who are having an AMI recommend that the patient should be given oxygen to breathe. Other recommended treatments in international guidelines include aspirin, nitrates and morphine. Some of these treatments have a well established research base, others do not.

AMI occurs when the flow of oxygenated blood in the heart is interrupted for a sustained period of time. The rationale for providing supplemental oxygen to a patient with AMI is that it may improve the oxygenation of the ischaemic myocardial tissue and reduce ischaemic symptoms (pain), infarct size and consequent morbidity and mortality. This pathophysiological reasoning has face validity.

Although it is biologically plausible that oxygen is helpful, it is also biologically plausible that it may be harmful. Potentially harmful mechanisms of oxygen therapy include the paradoxical effect of oxygen in reducing coronary artery blood flow and increasing coronary vascular resistance from hyperoxia, reduced stroke volume and cardiac output, and other adverse haemodynamic consequences such as reperfusion injury from increased oxygen free radicals.

Intervention: Inhaled oxygen at normal pressure delivered by face mask or nasal cannula, at any concentration.

Bottom line: The review found three randomised controlled trials and a further study that compared one group given oxygen to another group given air.¹⁻⁴ In total 387 participants were recruited, 74% were male. Primary outcomes examined were mortality rates and pain reduction. In all three included trials the intervention was inhaled oxygen at 4 to 6 L/min. The comparator was air in all three studies. Deaths were reported in all three studies. Pain or analgesic use (as a proxy for pain) was reported in two studies. One study included as surrogate outcomes the infarct size estimated by electrocardiogram (ECG) or biochemical markers.

These trials involved a total of 387 patients of whom 14 died. Of those who died, nearly three times as many people known to have been given oxygen died compared to those known to have been given air. None of the studies demonstrated that oxygen therapy in patients with AMI does more good than harm on clinical outcomes.

Caveat: The evidence in this area is sparse, of poor quality and pre-dates the advances in reperfusion techniques and trial methods. The trials had few participants and few deaths, so this result does not necessarily mean that giving oxygen increases the risk of death. The difference in outcome may have occurred simply by chance. Nonetheless, since the evidence suggests that oxygen may in fact be harmful, the authors suggest it is important to evaluate this widely used treatment in a large trial to make sure that current practice is not causing harm to people who have had a myocardial infarction. There is a need for a randomised controlled trial to establish the effectiveness of, or harm from, the administration of oxygen to patients with AMI. Current evidence neither supports nor clearly refutes the routine use of oxygen in patients with AMI.

Podcast

Follow this link to listen to the Cochrane Collaboration podcast on this topic:
<http://www.cochrane.org/podcasts/issues-4-6-april-june-2010/oxygen-therapy-acute-myocardial-infarction>

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Cochrane Systematic Review:

Cabello JB, Burls A, Empanaza JI, Bayliss S, Quinn T. Oxygen therapy for acute myocardial infarction. *Cochrane Database of Systematic Reviews* 2010, Issue 6. Art. No.: CD007160. DOI: 10.1002/14651858.CD007160.pub2. This review contains three trials reporting on 387 patients.