Association between pre-hospital time intervals and ST-elevation myocardial infarction system performance


Treatment guidelines for patients with ST segment-elevation myocardial infarction (STEMI) recommend that the time interval from first medical contact to percutaneous coronary intervention (PCI) should be ≤90 minutes. These investigators retrospectively reviewed data from 165 patients who underwent PCI for STEMI to determine which pre-hospital time intervals had the greatest influence on whether patients would meet this time recommendation. Of the 165 patients, 66.7% received PCI ≤90 minutes after the 911 call. On average, nearly half of the 90 minutes pre-hospital time was used to transport the patient from the scene of the MI to placement on the cardiac catheterization table (42.6 minutes). Patients with a time from scene departure to arrival on the table of ≤30 minutes were 11.1 times more likely to achieve PCI in less than 90 minutes than those with longer travel times. Other important variables which increased the likelihood of meeting the ≤90 minute deadline were response time ≤11 minutes (odds ratio, OR 9.2), ECG time ≤8 minutes (OR 3.4) and time at the scene ≤15 minutes (OR 9.6).

Reviewer's comment

In 1967, Dr Frank Pantridge introduced the modern era of pre-hospital emergency cardiac care, by introducing a specialized ambulance system in Belfast at the Royal Victoria Hospital. Pre-hospital emergency cardiac care has evolved in leaps and bounds since then, but there is still much needed to be done to improve and rapidly expedite primary PCI to acute MI patients in the shortest time possible.

In this study, which should be read by all paramedics, primary care physicians, cardiologists and staff involved in emergency cardiac care, three intervals were found to be most associated with getting a patient to primary PCI within 90 minutes:

1. 911 call - to - scene time of less than 10 minutes.
2. Total scene time of less than 15 minutes and
3. Scene - cathlab table time of less than 30 minutes.

The finding that 90% of acute MI patients who could be transported within 30 minutes were treated by PCI within 90 minutes is hugely significant. Hospitals countrywide should establish workable, highly polished and closely monitored systems for rapidly and seamlessly triaging patients with acute MI. Sadly, too much time is still wasted. Time, for the cardiologists not only means money, but also muscle/myocardium. Every attempt, at all different levels and stages, should be made for rapidly treating the acute MI patient with the best possible tools and devices at our disposal.

Coenzyme Q10 improves endothelial dysfunction of the brachial artery in type II diabetes mellitus


Endothelial dysfunction is an early feature of diabetic vasculopathy and is thought to be due, at least in part, to a reduction in nitric oxide synthesis as a consequence of oxidative stress associated with hyperglycaemia and its sequelae. Coenzyme Q10 (CoQ10) is a powerful antioxidant and may be deficient in patients with diabetes.

In order to investigate whether supplementation of CoQ10 in patients with diabetes may improve vascular function these investigators randomised 40 diabetic patients with dyslipidaemia to receive CoQ10 100 mg twice daily or placebo for a period of 12 weeks. Endothelial-dependent and endothelial-independent vasodilation were measured using flow-
mediated vasodilation and glyceryl-trinitrate-mediated vasodilation, respectively, at baseline and after treatment, and were also compared to that in 18 subjects without diabetes. Oxidative stress and plasma antioxidant status were assessed by measuring plasma F$_2$-isoprostane concentrations and oxygen radical absorbance capacity, respectively.

Compared to non-diabetic subjects, the patients with diabetes had impaired flow-mediated dilation of the brachial artery (3.8% vs. 6.4%; P=0.016). Supplementation with CoQ10 was associated with a 1.6% increase of flow-mediated dilation, whereas vasodilation decreased by 0.4% in the placebo group. Dilation associated with glyceryl-trinitrate was similar in diabetic and non-diabetic subjects and after treatment, was similar in the CoQ10 and placebo groups. CoQ10 supplementation increased plasma levels of CoQ10, but did not alter plasma F$_2$-isoprostane concentrations or oxygen radical absorbance capacity. Lipid concentrations, glycaemic control and blood pressure were also unaffected by treatment.

**Reviewer's comment**

Using brachial ultrasound and pulse wave Doppler the authors assessed brachial artery diameter and flow parameters before and after vasodilatory stimuli, in a group of 40 patients with type 2 DM and dyslipidaemia. They demonstrated improvement in endothelial function by CoQ10 independent of anti-oxidant status. This study used sophisticated techniques to demonstrate some clinical benefit of CoQ10. This is in contrast to the next article where benefit is reported across a broad spectrum of cardiac conditions which have heart failure as a common denominator / component.

**Usefulness of coenzyme Q10 in clinical cardiology: a long-term study**


The purpose of this study was to investigate the therapeutic benefit of coenzyme Q10 (CoQ10) in patients with cardiovascular disease (CVD). Four hundred and twenty four patients with various forms of CVD, including ischaemic cardiomyopathy, dilated cardiomyopathy, primary diastolic dysfunction, hypertension, mitral valve prolapse and valvular heart disease were treated with CoQ10 for an average duration of 17.8 months (50% were followed for 1-12 months) and with doses ranging from 75 to 600 mg/day. In 297 patients, blood CoQ10 levels were monitored and the dose was adjusted to maintain levels of ≥2 mcg/ml. Existing medications were continued.

Clinical response was evaluated using the New York Heart Association (NYHA) functional scale. Of the entire group, 1.2% improved by 3 NYHA classes, 28.3% improved by 2 classes, and 58.2% improved by 1 class. NYHA class did not change in 12.0% of patients. Pretreatment ECGs were available for 210 patients and statistically significant improvements were demonstrated on repeat ECG for left ventricular wall thickness, mitral valve inflow slope and fractional shortening. Patients with hypertension and mitral valve prolapse with small, poorly compliant hearts demonstrated a significant increase in heart size towards normal.

Improvements in NYHA status was associated with decreased requirement for concomitant medication and 43% of patients discontinued between 1 to 3 medications. There were no apparent adverse effects of CoQ10 administration other than a single case of transient nausea.

**Reviewer's comment**

Whilst this study was conducted over an 8 year period, the average patient follow-up was about 18 months. The authors used NYHA functional class and echocardiography to monitor response to 75-600 mg/day of CoQ10 across a wide range of conditions: ‘ischemic’ cardiomyopathy (ICM), dilated cardiomyopathy (DCM), primary diastolic dysfunction (PDD), hypertension (HTN), mitral valve prolapse (MVP) and valvular heart disease (VHD). They report improvement in NYHA class in the majority of patients. These conditions have left ventricular dysfunction or heart failure as a common thread.

The study can be criticized for been too broad-based and lacking basic science evidence. However, the authors refer to mitochondrial bio-energetics as the most probable cause of clinical improvement. More recent studies using clinical research and laboratory methods provide more convincing evidence of beneficial potential of CoQ10 overall.

**Vascular reactivity and flow characteristics of radial artery and long saphenous vein coronary bypass grafts: a 5 year follow-up**


Compared to arteries used for aortocoronary bypass grafts, venous grafts tend to demonstrate accelerated atherosclerosis and poor endothelial-mediated vasodilation. At 5 years after bypass surgery, angiographic studies show that grafts using radial artery anastomosed to a branch of the circumflex artery have significantly greater patency rates than saphenous vein grafts (98.3% vs. 86.4%; P=0.04). The aim of this study was to compare vasomotor and flow responses to endothelium-dependent and -independent stimuli in radial artery and saphenous vein grafts 5 years after surgery. Infracoronary
Doppler and quantitative coronary angiography were used to measure graft blood flow velocity and luminal diameter before and after intragraft infusions of adenosine, acetylcholine and isosorbide dinitrate in 15 patients with a radial artery graft and 12 patients with a saphenous vein graft. At rest, compared to the venous grafts, luminal diameter was significantly smaller and blood flow velocity was significantly greater in the radial artery grafts. Volume blood flows, however, were similar. Flow mediated vasodilation was preserved in the arterial grafts, but not in the venous grafts. The radial artery grafts dilated in response to adenosine and isosorbide dinitrate, whereas the venous grafts did not. There was no significant difference in responses to acetylcholine between the graft types. Changes in volume blood flow to pharmacological challenge was similar in the groups for each of the three agents.

**Reviewer’s comment**

Revascularisation by coronary bypass grafting utilises internal thoracic artery, radial artery, saphenous vein, gastroepiploic artery, umbilical vein or cryo-preserved vein. The left internal thoracic artery (LITA) has a huge, indisputable advantage and longevity when used for the LAD. Recent improvements in procurement techniques of the radial artery (RA) and improved medical therapy to prevent spasm has renewed interest in the RA as a second best choice.

This elegant prospective clinical study by Webb and colleagues shows that patent radial arteries showed vascular reactivity when exposed to adenosine and isosorbide dinitrate; saphenous veins did not demonstrate a similar reactivity. However, other factors also affect long-term patency, such as surgical technique, target vessel, use of peri-operative anti-spasm agents and optimal risk-factor neutralization.

Also, in a recently published study (Hayward, *et al.* J Thorac Cardiovasc Surg 2010; 139:60-67), angiography at 5 years post bypass showed that there was no significant difference between arterial and venous conduits - the patency of SVGs was similar to that of the RA and RITA at 5 years in the younger (> 70 yrs) group. Vascular reactivity of conduits, however, does not translate into superiority, and choice of conduits for vessels other than the left anterior descending artery needs to be individualised. Much work is still needed in the search for the ideal conduit.

**Prognostic value of lead V1 ST elevation during acute inferior myocardial infarction**


Right ventricular infarction and posterolateral left ventricle infarction are associated with a worse prognosis in patients with an inferior acute myocardial infarction (AMI). Right ventricular involvement during AMI may be associated with ST elevation in V1, and posterolateral involvement may be associated with ST depression in V1 to V3. Consequently, ST elevation from right ventricular AMI may not be present when there is also posterolateral AMI, which cancels it out by causing ST depression. Therefore, because ST changes in V1 predominantly reflect pathology in the left ventricle, diagnosis of right ventricular infarction during an inferior AMI may be facilitated by examining both V1 and V3 ST changes. The aim of this study was to investigate the prognostic value of ST elevation in V1, with adjustment for lead V3, for 30-day mortality in patients with inferior AMI who were recruited into the Hirulog and Early Reperfusion or Occlusion-2 (HERO-2) trial. In HERO-2, patients with ST-elevation AMI were randomised to receive bivalirudin or heparin in addition to streptokinase and aspirin. The primary endpoint, 30-day mortality, was similar regardless of treatment group.

In this analysis, data from 7 967 patients with acute inferior myocardial infarction was reviewed. V1 ST elevation at baseline was associated with a higher mortality. Regardless of whether V1 ST depression was present or not, every 0.5 mm incremental increase in ST level above 0 mm was associated with an increase in 30-day mortality of approximately 25%. After adjustment for inferolateral ST elevation and clinical factors the odds ratio (OR) for mortality was 1.24 (95% confidence interval, CI95%: 1.07-1.37), and after adjustment for V3 ST level, the odds ratio was 1.24 (CI95%: 1.09-1.40). Odds ratios for mortality associated with V1 ST elevation ≥1 mm was 1.28 unadjusted, 1.51 after adjusting for V3 ST level and 1.35 after adjustment for ECG and clinical factors. Compared to patients whose ST elevation resolved, those with ST elevation persisting at 60 minutes after fibrinolysis had a higher mortality, regardless of whether the ST cut point was 1 mm (10.8% vs. 5.5%, P=0.001) or 0.5 mm (9.1% vs. 4.4%; P<0.001).

**Reviewer’s comment**

This large study of almost 8000 patients with acute inferior MI in the HERO-2 trial (Hirulog and Early Reperfusion or Occlusion-2), analysed the prognostic value of V1 ST elevation. This simple clinical tool separates the high-risk and poor prognosis (30 day mortality 28% higher) of associated RV infarction; the latter is associated with a worse outcome in both patients receiving fibrinolysis and those undergoing primary PCI; because of the smaller RV myocardial mass, infarction of the RV free wall has much worse prognosis when compared with a posterolateral wall infarct. The use of this readily available information for prognosis in a patient with acute inferior infarct should be encouraged by those involved in primary PCI.