British Acupuncture Council

ACUPUNCTURE AND CORONARY HEART DISEASE

About coronary heart disease

Coronary heart disease (sometimes called ischaemic heart disease) occurs when cholesterol builds up in the coronary arteries and atherosclerotic plaques form. Over time, this causes narrowing and hardening of the coronary arteries that supply blood to the heart. Oxygen supply to the heart muscle is reduced and this can lead to angina pectoris (chest pain) and eventually myocardial infarction (heart attack) or heart failure.

About 82,000 people die because of coronary heart disease every year in the UK. It is the country's biggest killer, and accounts for around one in five deaths in men and one in eight deaths in women (NHS Choices 2014; Peterssen 2005). Risk factors include smoking, high blood cholesterol, hypertension, obesity, diabetes, physical inactivity and a family history of heart disease.

Conventional medical treatment includes lifestyle changes such as stopping smoking, modifying diet and increasing exercise; drugs such as statins, nitrates, ACE inhibitors, angiotensin II receptor blockers, calcium channel blockers, beta blockers and antiplatelet drugs; and surgery such as coronary artery bypass grafts.

References

Coronary heart disease. NHS Choices. Available: http://www.nhs.uk/Conditions/Coronary-heart-disease/Pages/Introduction.aspx [Accessed 25 January 2014]

Peterssen S, Peto V, Scarborough PRM. Coronary Heart Statistics. London: British Heart Foundation, 2005.

How acupuncture can help

This factsheet looks at the evidence for acupuncture in the treatment of coronary heart disease including angina pectoris and myocardial infarction. There are related factsheets on hypertension, stroke, and arrhythmias and heart failure.

A systematic review of 16 randomised controlled trials (RCTs) (Chen 2012) found that acupuncture added to plus conventional drugs reduced the occurrence of acute myocardial infarction. Compared with drugs alone, both acupuncture alone and acupuncture plus conventional drugs proved more effective at relieving angina symptoms and improving ECGs. However, compared with conventional treatment, acupuncture alone showed a longer delay before its onset of action, probably indicating that it is not suitable for emergency treatment of myocardial infarction.

A randomised controlled trial (RCT) found that acupoint pressing can significantly improve symptoms of angina pectoris, and has a similar therapeutic effect to glyceryl trinitrate, but provides more rapid relief and without adverse effects (Wang 2011). Another RCT found that acupuncture combined with medication is safe and effective for intractable angina pectoris and can improve short-term prognosis compared with medication alone (Xu 2005). A clinical study assessing the effect of acupuncture at point Neiguan (PC6) in patients with angina pectoris and acute myocardial infarction found it more effective than isosorbide dinitrate and nifedipine (Meng 2004).

Most or all of the RCTs in this area have been carried out in China and there is a need for them to be repeated elsewhere. The potential value of acupuncture for angina was strikingly demonstrated in a Danish matched control study (Ballegaard 1999) and reinforced subsequently by the same author (Ballegaard 2004). Integrated treatment combining acupuncture with self care with/without medication was found to be substantially cost-effective (due mainly to a reduced need for hospitalisation and surgery) and add years to patients' lives.

For silent myocardial ischaemia, a RCT showed that acupuncture may have a good therapeutic effect on heart rate, blood pressure and ST segment depression (an indicator of ischaemia), superior to that of herbal medicine (Diao 2011).

Acupuncture is used in various settings for control of nausea and vomiting (see BAcC Fact Sheet on this subject) and it was found effective for this (as an adjunct to medication) for post-heart attack patients in one partially randomised trial (Dent 2003).

In general, acupuncture is believed to stimulate the nervous system and cause the release of neurochemical messenger molecules. The resulting biochemical changes influence the body's homeostatic mechanisms, thus promoting physical and emotional well-being.

There are many published studies from China investigating the mechanisms by which acupuncture may affect heart disease. Nearly all have used electro-stimulation in animal models of myocardial ischaemia. Research has shown that acupuncture treatment may benefit coronary heart disease by:

- minimising myocardial injury, probably partially by reducing serum cardiac troponin I and C-reactive protein levels (Ni 2012);

- inhibiting cardiac sympathetic nervous system activity (and hence noradrenaline and adrenaline), in order to relieve myocardial ischaemia (Li 2012a; Zhou 2012);
- activation of myocardial opioid receptors, and subsequent signalling by protein kinases such as PKC, has a protective effect against ischaemia (Zhou 2012);
- lowering levels of myocardial enzymes (serum aspartate aminotransferase, isoenzymes of creatine kinase, lactate dehydrogenase, creatine kinase, and alpha-hydroxybutyrate dehydrogenase) to prevent ischaemic myocardial injury (Huang 2012);
- regulating nerve electrical activity in the spinal dorsal roots and concentrations of norepinephrine and dopamine in the paraventricular nucleus of the hypothalamus (Li 2012b);
- regulating JNK signalling pathways (mitogen-activated protein kinases that transmit signals of stress stimuli) to possibly prevent and treat cardiac hypertrophy (Wang 2012);
- activating baroreceptor sensitive neurons in the nucleus tractus solitarius in a similar manner to the baroreceptor reflex in cardiovascular inhibition (Gao 2011);
- upregulating myocardial nitric oxide and nitric oxide synthase content and downregulating myocardial intracellular calcium levels, which may contribute to its effect in relieving myocardial injury (Wang 2010);
- acting on areas of the brain known to reduce sensitivity to pain and stress, as well as promoting relaxation and deactivating the 'analytical' brain, which is responsible for anxiety and worry (Hui 2010);
- reducing inflammation, by promoting release of vascular and immunomodulatory factors (Kavoussi 2007).

About traditional acupuncture

Acupuncture is a tried and tested system of traditional medicine, which has been used in China and other eastern cultures for thousands of years to restore, promote and maintain good health. Its benefits are now widely acknowledged all over the world, and in the past decade traditional acupuncture has begun to feature more prominently in mainstream healthcare in the UK. In conjunction with needling, the practitioner may use techniques such as moxibustion, cupping, massage or electro-acupuncture. They may also suggest dietary or lifestyle changes.

Traditional acupuncture takes a holistic approach to health and regards illness as a sign that the body is out of balance. The exact pattern and degree of imbalance is unique to each individual. The traditional acupuncturist's skill lies in identifying the precise nature of the underlying disharmony and selecting the most effective treatment. The choice of acupuncture points will be specific to each patient's needs. Traditional acupuncture can also be used as a preventive measure to strengthen the constitution and promote general wellbeing.

An increasing weight of evidence from Western scientific research (see overleaf) is demonstrating the effectiveness of acupuncture for treating a wide variety of conditions. From a biomedical viewpoint, acupuncture is believed to stimulate the nervous system, influencing the production of the body's communication substances - hormones and neurotransmitters. The resulting biochemical changes activate the body's self-regulating homeostatic systems, stimulating its natural healing abilities and promoting physical and emotional wellbeing.

About the British Acupuncture Council

With over 3000 members, the British Acupuncture Council (BAcC) is the UK's largest professional body for traditional acupuncturists. Membership of the BAcC guarantees excellence in training, safe practice and professional conduct. To find a qualified traditional acupuncturist, contact the BAcC on 020 8735 0400 or visit www.acupuncture.org.uk

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The evidence

Research	Conclusion
Systematic review	
Chen J et al. Acupuncture therapy for angina pectoris: a systematic review. J Tradit Chin Med. 2012;32(4):494-501.	A systematic review that assessed the effectiveness and safety of acupuncture therapy for angina pectoris. It included 16 randomised controlled trials (RCTs). Meta-analysis showed that acupuncture alone was superior to conventional drugs for angina symptoms (OR = 3.59, 95% CI 1.76 to 7.92) and electrocardiography (ECG) improvements (OR 3.07, 95% CI 1.54 to 6.10). It also showed that acupuncture combined with conventional drugs was superior to conventional drugs alone in reducing the incidence of acute myocardial infarction (odds ratio [OR] 0.18, 95% CI 0.04 to 0.84), relieving angina symptoms (OR 4.23, 95% CI 2.73 to, 6.56), improving ECGs (OR 2.61, 95% CI 1.83 to 3.73), and shortening the time to onset of angina relief (weighted mean difference [WMD] -1.40, 95% CI -1.65 to-1.15). However, the time to onset was significantly longer for acupuncture alone than for conventional treatment alone (WMD 2.43, 95% CI 1.63 to 3.23). The reviewers concluded that acupuncture plus conventional drugs reduced the occurrence of acute myocardial infarction, and both acupuncture alone and acupuncture plus conventional drugs relieved angina symptoms and improved ECGs. However, compared with conventional treatment, acupuncture showed a longer delay before its onset of action. They concluded that this shows acupuncture is not suitable for emergency treatment of myocardial infarction.
Clinical trials	
Wang YM et al. Comparative study on acupoint pressing and medication for angina pectoris due to coronary heart disease. [Article in Chinese] Zhongguo Zhen Jiu. 2011;31(7):595-8.	A randomised controlled trial comparing the effects of acupoint pressing, glyceryl trinitrate and Suxiaojiuxin in angina pectoris caused by coronary heart disease. It included 168 patients with angina pectoris. The total effective rate and the effective rate of ECG were 93.1% (54/58) and 86.2% (50/58) in the acupoint pressing group respectively, 92.9% (52/56) and 85.7% (48/56) in the glyceryl trinitrate group, and 87.0% (47/54) and 75.9% (41/54) in the Suxiaojiuxin pill group, with no significant differences between the three groups (all p>0.05). The average time to effectiveness was 1.67 (+/- 2.45) minutes in the acupoint pressing group, which was shorter than 2.89 (+/- 2.64) minutes in the glyceryl trinitrate group (p<0.05) and 3.75 (+/- 2.99) minutes in the Suxiaojiuxin pill group (p<0.001). There were no adverse effects in the acupoint pressing group, while 19 patients in the glyceryl trinitrate group and 12 patients in the Suxiaojiuxin pill group (both p<0.05) experienced adverse effects. The researchers concluded that acupoint pressing can significantly improve symptoms of angina pectoris, and has a similar therapeutic effect to glyceryl trinitrate and Suxiaojiuxin pills, but has a more rapid effect and without adverse effects.

Diao LH et al. Observation on therapeutic effects of electroacupuncture at Neiguan (PC 6) on silent myocardial ischemia. [Article in Chinese] Zhongguo Zhen Jiu. 2011;31(7):591-4.	A randomised controlled trial that looked at the therapeutic effects of electroacupuncture (EA) on silent myocardial ischaemia (SMI). Forty patients with SMI were randomised into an EA group and a Chinese herbal medicine group. The total effective rate was better in the EA group (95.0%) than in the Chinese herbal medicine group (75.0%; $p<0.05$). After treatment, heart rate, systolic blood pressure and diastolic blood pressure in the two groups had all decreased significantly ($p<0.01$, $p<0.05$), but more so in the EA group (all $p<0.05$). Also, the SMI duration and the number of ST segment depressions fell significantly in both groups ($p<0.01$, $p<0.05$), more so in the EA group ($p<0.05$). The researchers concluded that acupuncture has a good therapeutic effect in SMI, and can decrease heart rate and blood pressure and reduce ST segment depression.
Xu FH, Wang JM. Clinical observation on acupuncture combined with medication for intractable angina pectoris. [Article in Chinese] Zhongguo Zhen Jiu. 2005;25(2):89-91.	A randomised controlled trial that compared the clinical effects of acupuncture plus medication with medication alone on intractable angina pectoris (IAP). IT included 70 patients with IAP. The control group was given nitric acid ester, a beta blocker, a calcium antagonist, aspirin and hypo-molecular heparin, and the treatment group were also treated with acupuncture. The total effective rates for symptoms and ECG were 88.6% and 62.9% in the treatment group and 60.0% and 31.4% in the control group respectively. The incidence of acute heart attack and sudden death was 5.7% in the treatment group and 20.0% in the control group. There were with no serious adverse effect with acupuncture. The researchers concluded that acupuncture combined with medication is safe and effective for intractable angina pectoris and can improve short-term prognosis compared with medication alone.
Ballegaard S et al. Long-term effects of integrated rehabilitation in patients with advanced angina pectoris: a nonrandomized comparative study. J Altern Complement Med. 2004;10(5):777-83.	A clinical study that evaluated acupuncture plus self care in 168 patients with angina pectoris. Self-care included acupressure, Chinese health philosophy, stress management techniques, and lifestyle adjustments. The outcome measures were death rate from any cause, the need for invasive treatment, and health care expenses. The 3-year accumulated risk of death for the patients who needed invasive treatment was 2.0% (95% CI 0.0% to 4.7%)in the acupuncture group, compared to 5.4% (95% CI 4.7% to 6.1%), and 8.4% (95% CI 7.7% to 9.1%) for those who had angioplasty and coronary artery bypass grafting respectively. For the 65 patients who could not have surgery, the risk of death due to heart disease was 7.7% (95% CI 3.9% to 11.5%) in the acupuncture group, compared with 16% (95% CI 10% to 34%) and 25% (95% CI 18% to36%) for those treated with laser revascularization or medication respectively. Cost savings over 3 years were 36,000 US dollars and 22,000 US dollars for surgical and nonsurgical patients respectively. The researchers concluded that integrated rehabilitation comprising acupuncture and self care was found to be cost effective, and added years to the lives of patients with severe angina pectoris.
Meng J. The effects of acupuncture in treatment of coronary heart diseases. J Tradit Chin Med. 2004;24(1):16-9.	A clinical study assessing the effect of acupuncture at point Neiguan (PC6) in patients with angina pectoris and acute myocardial infarction. The effective rate with acupuncture was 91.3%, which was signficanlty better than the effective rate with isosorbide dinitrate and nifedipine ($p<0.01$).

Dent HE et al. Continuous PC6 wristband acupressure for relief of nausea and vomiting associated with acute myocardial infarction: a partially randomised, placebo-controlled trial. Complement Ther Med. 2003;11(2):72-7.	A partially randomised clinical study that looked at the effectiveness of continuous acupressure at point Neiguan (PC6) as an adjunct to antiemetic drug therapy for the prevention and control of nausea and vomiting in the first 24 hours after myocardial infarction (MI). A total of 301 consecutive patients (205 males, 96 females) admitted following acute MI were included in the study. The first 125 patients were given no additional intervention, while subsequent patients were randomised to receive either continuous PC6 acupressure or placebo acupressure. There were no significant differences between the groups for the 24-hour treatment period as a whole. However, the PC6 acupressure group had a significantly lower incidence of nausea and/or vomiting during the last 20 hours (18%), compared with the placebo (32%) or control (43%) groups ($p<0.05$). The severity of symptoms and the need for antiemetic drugs were also reduced in the acupressure group, but not statistically significantly so. The researchers concluded that continuous 24-hour PC6 acupressure therapy as an adjunct to standard antiemetic medication for post-MI nausea and vomiting is feasible, and is well accepted and tolerated by patients.
Ballegaard S et al. Addition of acupuncture and self-care education in the treatment of patients with severe angina pectoris may be cost beneficial: an open, prospective study. J Altern Complement Med. 1999;5(5):405-13.	An open prospective study and cost-benefit analysis of acupuncture and self-care education in the treatment of patients with angina pectoris. Three control groups were used: (1) published data concerning medical and invasive treatments; (2) an age- and sex-matched group obtained from a randomly selected Danish population of 14,000 people; and (3) the 211 patients in this group with angina pectoris symptoms. A total of 105 patients with angina pectoris were included, comprising 73 candidates for invasive treatment, and 32 for whom this was rejected. Acupuncture and self-care education was added to pharmaceutical treatment. The estimated cost savings during 5 years were 32,000 US dollars per patient, mainly due to a 90% reduction in hospitalisation and a 70% reduction in needed surgery. Compared to 8% before treatment, 53% of the patients achieved a life without limitations (NYHA 0-I) 1 year after treatment, as did 69% after 5 years. No increased risk for myocardial infarction or cardiac death was seen. The researchers concluded that the addition of acupuncture and self-care education was found to be cost beneficial in patients with advanced angina pectoris.

Physiological studies

Ni X et al. Cardioprotective effect of transcutaneous electric acupoint stimulation in the pediatric cardiac patients: a randomized controlled clinical trial. Paediatr Anaesth. 2012;22(8):805-11.	A randomised controlled trial that looked at the effects of transcutaneous electric acupoint stimulation (TEAS) on acute myocardial injury from paediatric open-heart surgery. It included 70 children, aged 2-12 years, with congenital heart defects scheduled for surgical repair. They were allocated to TEAS or a control group. Compared with the control group, the mean 24-hour serum cardiac troponin I (cTnI) levels (the primary end point) were significantly lower in the TEAS group at 8 hours ($p=0.043$) and 24 hours ($p=0.046$) after aortic unclamping. The duration of ventilation ($p=0.004$) and length of ICU stay ($p=0.032$) were significantly longer in the control group than in the TEAS group. There was a significant difference in the release of C-reactive protein at 8 hours ($p=0.039$) between the two groups, whereas the values for cytokines were not significant. The

	researchers concluded that TEAS is effective for minimising myocardial injury in children having cardiac surgery. The beneficial effects may be partially associated with reduced cTnI and C-reactive protein levels in the early postoperative period.
Li MP et al. Effects of electroacupuncture stimulation of scalp-point on cardiac sympathetic discharges, myocardial beta1-adrenoceptor protein expression and plasma norepinephrine concentration in myocardial ischemia-reperfusion injury rats. [Article in Chinese] Zhen Ci Yan Jiu. 2012a;37(5):385-9.	A study that explored the mechanism of electroacupuncture (EA) in the management of myocardial ischaemia-reperfusion injury (MI/RI) by examining its effects on left cardiac sympathetic nerve activity, myocardial beta1-adrenaline receptor (AR) protein expression and plasma norepinephrine (NE) concentration in rats. In comparison with the model group, sympathetic discharges, plasma NE levels and myocardial beta1-AR protein expression in the EA group were down-regulated significantly ($p<0.05$). The researchers concluded that EA can suppress MI/RI induced increase of sympathetic nerve activity, and plasma NE levels and beta1-AR protein expression, which may contribute to its effect in relieving myocardial ischaemia.
Wang H et al. Effects of electroacupuncture at neiguan (PC6) on c-Jun NH2-teminal kinase signaling pathways in hypertrophic myocardial cells. [Article in Chinese] Zhongguo Zhong Xi Yi Jie He Za Zhi. 2012;32(8):1099-102.	An animal study of the effects of electroacupuncture (EA) at Neiguan (PC6) on c-Jun NH2-terminal kinases (JNK) signalling pathways in hypertrophic myocardial cells in rats. Compared with the model group, left ventricular weight index (LVWI) and heart weight index (HWI), the content of angiotensin II (Ang II) in the cardiac muscular tissue, and the protein expressions of JNK and phosphorylated JNK (p-JNK) in cardiocytes were significantly higher in the EA group ($p<0.05$). The researchers concluded that EA at PC6 could prevent and treat cardiac hypertrophy possibly by regulating JNK signalling pathways, and by regulating its upstream neuroendocrine factors.
Huang RL et al. Effect of electroacupuncture pre-treatment on myocardial enzyme levels in recurrent myocardial ischemia rabbits. [Article in Chinese] Zhen Ci Yan Jiu. 2012;37(3):224-8.	An animal study that looked at the effect of electroacupuncture (EA) preconditioning of "Neiguan" (PC 6) on myocardial enzyme levels in rabbits with acute recurrent myocardial ischaemia. EA preconditioning was found to have an effect in the prevention of ischaemic myocardial injury, an effect that was closely associated with its functions in lowering serum aspartate aminotransferase, isoenzymes of creatine kinase, lactate dehydrogenase, creatine kinase, and alpha-hydroxybutyrate dehydrogenase.
Li M et al. Effects of electroacupuncture at PC6 and BL15 on nerve electrical activity in spinal dorsal root and norepinephrine and dopamine contents in paraventricular nucleus of hypothalamus in rats with acute myocardial ischemia. [Article in Chinese] Zhong Xi Yi Jie He Xue Bao. 2012b;10(8):874-9.	An animal study that investigated the effects of electroacupuncture (EA) at Neiguan (PC6) and Xinshu (BL15) on the nerve electrical activity in the spinal dorsal root and norepinephrine (NE) and dopamine (DA) concentrations in the paraventricular nucleus of the hypothalamus in rats with acute myocardial ischaemia. The researchers concluded that EA at both PC6 and BL15 acupoints exhibited synergistic protective effects against acute myocardial ischaemia, and that the possible mechanism is related to regulating nerve electrical activity in spinal dorsal roots and the concentrations of NE and DA in paraventricular nucleus of the hypothalamus.
Zhou W et al. Cardioprotection of electroacupuncture against myocardial ischemia-reperfusion injury by modulation of cardiac norepinephrine release. Am J Physiol Heart Circ Physiol.	An animal study that looked at the effects of electroacupuncture (EA) on left ventricular (LV) function, O(2) demand, infarct size, arrhythmogenesis, and in vivo cardiac norepinephrine (NE) release in a myocardial ischaemia-reperfusion model. The researchers concluded that their results suggested that the cardioprotective effects of EA against myocardial ischaemia-

2012;302(9):H1818-25.	reperfusion are mediated through inhibition of the cardiac sympathetic nervous system, as well as via opioid- and PKC-dependent pathways.
Gao XY et al. Acupuncture-like stimulation at auricular point Heart evokes cardiovascular inhibition via activating the cardiac-related neurons in the nucleus tractus solitarius. Brain Res. 2011;1397:19-27.	An animal study that investigated the role of baroreceptor sensitive neurons of the nucleus tractus solitarius in the regulation of cardiovascular inhibition during acupuncture at the auricular Heart point. The researchers concluded that their results showed that acupuncture at the auricular Heart point regulates cardiovascular function by activating baroreceptor sensitive neurons in the nucleus tractus solitarius in a similar manner to the baroreceptor reflex in cardiovascular inhibition.
Wang C et al. Influence of electroacupuncture on myocardial NO and NOS and intracellular Ca2+ contents in myocardial ischemia-reperfusion injury rats. [Article in Chinese] Zhen Ci Yan Jiu. 2010;35(2):113-7.	An animal study that investigated the effect of electroacupuncture (EA) on myocardial nitric oxide (NO) content, nitric oxide synthase (NOS), and intracellular Ca2+ levels in rats with experimental myocardial ischaemia-reperfusion injury (MI/RI), The research showed that EA of Neiguan (PC6) can upregulate myocardial NO and NOS content and downregulate myocardial intracellular Ca2+ levels in rats with MI/RI, which may contribute to its effect in relieving myocardial injury.
Hui KK et al. Acupuncture, the limbic system, and the anticorrelated networks of the brain. Auton Neurosci. 2010; 157(1-2): 81-90.	Studies have shown that acupuncture stimulation, when associated with sensations comprising deqi, evokes deactivation of a limbic-paralimbic-neocortical network, as well as activation of somatosensory brain regions. These networks closely match the default mode network and the anti-correlated task-positive network. The effect of acupuncture on the brain is integrated at multiple levels, down to the brainstem and cerebellum and appears to go beyond either simple placebo or somatosensory needling effects. Needling needs to be done carefully, as very strong or painful sensations can attenuate or even reverse the desired effects. Their results suggest that acupuncture mobilizes the functionally anti-correlated networks of the brain to mediate its actions, and that the effect is dependent on the psychophysical response. They discuss potential clinical application to disease states including chronic pain, major depression, schizophrenia, autism, and Alzheimer's disease.
Kavoussi B, Ross BE. The neuroimmune basis of anti-inflammatory acupuncture. Integr Cancer Ther 2007; 6: 251-7.	Review article that suggests the anti-inflammatory actions of traditional and electro-acupuncture are mediated by efferent vagus nerve activation and inflammatory macrophage deactivation.

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