

## Treating cardiovascular problems with acupuncture

The topic of veterinary acupuncture incites vigorous debates between proponents who advocate for its integration into mainstream medicine and critics who claim it has no rational basis. Certain questions arise regularly: Is there any evidence that acupuncture provides meaningful physiologic benefits? Does it matter where you insert the needle, or are the effects witnessed just a consequence of having a sharp object penetrate bodily tissue? Can acupuncture demonstrably influence internal organ function?

Several recent studies are helping shed light on these issues, with some focusing specifically on acupuncture for cardiovascular conditions. For centuries, acupuncturists have observed beneficial effects of acupuncture for human patients experiencing myocardial ischemia, arrhythmias, hypertension, and angina pectoris. Over the past few decades, researchers have explored the effects of acupuncture on cardiovascular function and hemodynamic parameters in dogs (Lee DC et al. Modification of cardiovascular function in dogs by acupuncture: a review. *Am J Chin Med.* 1976;4(4):333-346). For clinical applications, "Acupuncture can probably best be introduced into clinical practice as an adjunct to standard drug therapy. Acute management of shock, anesthetic overdose, and cardiopulmonary arrest are major indications for acupuncture...In addition to emergency situations, acupuncture could prove useful in treatment of heart failure, arrhythmias, or hypertension in animals that are unresponsive to drug therapy or that cannot tolerate the drug's side effects." (Smith, FWK. "Acupuncture for cardiovascular disorders". In Schoen AM: *Veterinary Acupuncture: Ancient Art to Modern Medicine*, 2<sup>nd</sup> edition. St. Louis: Mosby, Inc., 2001, p. 216.)

Since 2001, studies have centered on a specific acupuncture point called PC6 (Neiguan) for its particular impact on cardiovascular function in animals. This is the same point that has also received intensive research focus for its ability to relieve nausea after chemotherapy. PC6 lies over the median nerve, proximal to the carpus. Electrical stimulation applied to an acupuncture needle at PC6 evokes somatoautonomic responses that alter cardiac function and blood pressure. A 2001 study by Syuu et al. explored the beneficial effects of electroacupuncture (EA) on hemodynamics and cardiac contractility in anesthetized open-chest dogs (*Japanese Journal of Physiology.* 2001;51(2):231-238.). Under prolonged anesthesia without EA, the dogs demonstrated decreases in several cardiovascular parameters: mean arterial pressure, end-diastolic volume (EDV), heart rate, stroke volume (SV), cardiac output, and end-systolic pressure (ESP). When researchers applied EA to PC6, these variables instead increased by 10-15%. If researchers stopped EA, the altered cardiovascular variables decreased to pre-EA levels after one hour. The

authors concluded that EA at PC6 during long-term anesthesia provided beneficial effects by helping stabilize cardiovascular function.

EA at PC6 can raise blood pressure in several species experiencing shock, as shown by research investigations in humans, rabbits, and dogs. In 2003, Syuu et al investigated the effect of PC6 EA on left ventricular (LV) performance in dogs with experimentally-induced hemorrhagic hypotension (*Am J Physiol Integr Comp Physiol.* 2003;285:R1446-R1452). As in the previous study, EA at PC6 benefited LV function by recovering the decreased ESP, EDV, and SV. The effects of EA at PC6 were significantly more effective than EA at the control point on the thigh. This is the first study to demonstrate improved LV performance following hemorrhagic hypotension in anesthetized dogs with electroacupuncture at PC6, and provides further evidence for the clinical use of acupuncture for hemorrhagic hypotension and shock.

Somatic nerve stimulation systematically evokes hemodynamic pressor and depressor responses. Afferent excitation of the median nerve typically activates a sympathetic inhibition with release of endogenous opioids, gamma amino butyric acid (GABA), and serotonin. These mediators inhibit sympathetic neurons in the nucleus paragigantocellularis lateralis (PGL) of the medulla (rostral ventrolateral medulla, rVLM). The rVLM is an important center that is responsible, in part, for maintaining blood pressure and integrating cardiovascular reflexes.

Neurons in the PGL nucleus of the rVLM are also the source of spinal sympathetic outflow through the intermediolateral cell column. Impulses transmitted along this efferent pathway will diverge to both somatic and visceral structures innervated by the corresponding spinal segments. Muscles innervated by spinal nerves associated with the activated segments may subsequently become tense, tender, and “ropy”-feeling when palpated. Palpation of paraspinal areas segmentally is a common diagnostic approach in acupuncture (as well as chiropractic and osteopathic manipulative therapy) to detect viscerosomatic changes in the paraspinal tissues secondary to internal organ dysfunction. Palpatory changes and somatic dysfunction commonly occur in the cranial thoracic spinal segments in cases of cardiovascular problems, including myocardial infarction (Nicholas AS et al. A somatic component to myocardial infarction. *Br Med J (Clin Res Ed).* 1985;291(6487):13-17 and Beal MC. Palpatory testing for somatic dysfunction in patients with cardiovascular disease. *J American Osteopathic Association.* 1983;82:822-831).

The newest approach for analyzing the effect of somatosensory input, like electroacupuncture, to the median nerve involves the use of functional magnetic resonance imaging (fMRI). Recent work in Italy elucidated the differences in brain activation sites that process stimuli which are either non-painful or painful as a consequence to electrical stimulation over the median nerve (Ferretti A et al. Functional topography of the secondary somatosensory cortex for nonpainful

and painful stimuli: an fMRI study. *NeuroImage*. 2003;20:1625-1638). Since acupuncture stimulation is generally non-painful, this latest research provides insight into the central nervous system consequences of median nerve electrical stimulation more typically resembling acupuncture as practiced clinically. Determining whether or not these brain activation patterns relate to concomitant cardiovascular changes from median nerve electrical stimulation will require additional study.

Overall, these and other scientific studies exploring the influences and physiological mechanisms of EA on the cardiovascular system are helping develop a framework of evidential information upon which further study and exploration can build.