Continuous spinal cord stimulation improves heart function

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Spinal cord stimulation improves heart function and could become a novel treatment option for heart failure, according to research presented at the ESC Congress 2012 today by Professor Hung-Fat Tse from Hong Kong.

Heart failure is a progressive weakening of the heart muscle. It is a chronic condition that occurs when the heart cannot pump blood to meet the body's needs. When heart failure is present, not enough blood is circulating, which may cause fatigue. Further, fluid accumulation in the abdomen and legs and congestion in the lungs is common, and occurs when blood backs up waiting to enter the heart, causing fluid to leak into the surrounding tissue.

Spinal cord stimulators are implanted neurostimulation devices that are similar in function and appearance to cardiac pacemakers. Spinal cord stimulation (SCS) therapy uses an implanted device and thin wires with electrodes to deliver low levels of electrical energy to the spinal cord.

In this study, thoracic neurostimulation was used to determine if there was an improvement in the left ventricular contractile (or pumping) function of the heart compared with medical therapy alone in the treatment of heart failure.

Prior experimental studies have shown that the addition of intermittent thoracic SCS near the upper chest (at the level of thoracic vertebrae numbers T1-T2) improved left ventricular contractile function in animal models of ischemic heart failure.

The present experimental study compared the previously tested intermittent approach to a new continuous approach for SCS delivery. Pigs with ischemic heart failure were randomized into 3 groups: medical therapy only, intermittent SCS (four hours, three times a day) with medical therapy, or continuous SCS (24 hour) with medical therapy. Medical therapy included ACE inhibitors and beta-blockers, medications which have been approved for use in heart failure and shown to reduce mortality.

After ten weeks, echocardiograms showed similar and significant increases in left ventricular ejection fraction and increased ventricular contractile function in both groups of animals treated with intermittent or continuous SCS as compared with control group. "The ejection fraction is a measurement of how well the heart is pumping and represents the proportion of blood squeezed out of the heart with every beat," said Professor Tse, who is professor of cardiology in the Cardiology Division at Queen Mary Hospital, University of Hong Kong. "It is commonly used as a marker of prognosis, with a lower ejection fraction generally indicating a poorer prognosis. Our results indicate that both intermittent and continuous SCS improve

heart function."

Continuous SCS was associated with significant reduction of serum norepinephrine and brain natriuretic peptide compared with medical therapy alone. Professor Tse said: "Serum norepinephrine and brain natriuretic peptide are biomarkers that indicate the severity of heart failure. Our early findings suggest that continuous SCS may produce additional benefits over intermittent SCS."

"Improving the heart's pumping function is an important aspect of treating heart failure, and early research from this and other studies suggests that spinal cord stimulation could play an important role in aiding the heart's contractions," said Professor Tse. "Our research suggests that spinal cord stimulation could provide an alternative treatment option for treating heart failure. Further research is needed to determine what approach would be most beneficial."

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