

Coronary Sinus Cannula with Left Ventricle Lead and Pressure Tent

Published date: April 21, 2015

Technology description

Summary

Congestive heart failure is an expanding health concern, with more than 500,000 new cases each year. Cardiac resynchronization therapy (CRT) is effective in many of these patients. However, cannulation of the coronary sinus (CS), a critical step for lead insertion, is technically difficult and fails in 5-10% of attempts. Thus, there is a need for an improved cannula design as well as an alternative surgical technique that can simplify cannulation of the CS and improve the success rate of lead placement. This technology describes an improved coronary sinus cannula design and surgical approach for electrode placement.

Use of Right Parasternal Mediastinotomy (RPSM), improved introducer/obturators and pressure tent allows superior electrophysiological lead insertion with respect to speed, efficacy, physiologic effect, and incidence of complications.

This technology utilizes a non-traditional surgical approach, right parasternal mediastinotomy (RPSM), for cardiac lead insertion and a patient specific introducer/obturator system that reduces the amount of time required for lead insertion and trauma to the patient. This combination leads to improved patient outcomes, reduced hospital stays, and lower incidences of repeat surgeries. To facilitate this alternate surgical approach, an optional pressure seal can maintain negative intrapleural pressure for insertion under local anesthesia. RPSM reduces the amount of time required for lead insertion and enables easier access to the right atrium and right ventricle for lead placement. Additionally, for patients undergoing reoperation, where biventricular pacing through the left ventricle is not feasible, the team at Columbia has developed a technique to provide temporary biventricular pacing.

Custom, malleable introducer/obturators, matched to individual patient anatomy, shorten the distance between pacemaker and lead and further reduce the time required for surgical implantation. Custom introducer/obturators have been developed from CT scans of pig hearts. They have been inserted into the coronary sinuses of pig hearts using sensor-equipped catheters.

Publications

Wang DY, Richmond ME, Quinn TA, Mirani AJ, Rusanov A, Yalamanchi V, Weinberg AD, Cabreriza SE, Spotnitz H. Optimized temporary biventricular pacing acutely improves intraoperative cardiac output after weaning from cardiopulmonary bypass: a substudy of a randomized clinical trial. J Thorac Cardiovasc Surg. 2011;141:1002-8.

Wang DY, Gerrah R, Rusanov A, Yalamanchi V, Cabreriza SE, Spotnitz HE. Left ventricular pacing lead insertion via the coronary sinus cardioplegia cannula: a novel method for temporary biventricular pacing during reoperative cardiac surgery. J Thorac Cardiovasc Surg. 2011;142:73-6.

Application area

Placement of epicardial pacemaker leads

Developed technology could be adapted for other surgical procedures that utilize introducer/obturators to access intrapericardial space and cardiac chambers

RPSM for CRT in patients who fail standard endocardial approaches

RPSM for CRT in patients who are high risk candidates for thoracotomy because of adhesions

RPSM for all known pacemaker and defibrillator leads in all patients

Advantages

Open thoracotomy under local anesthesia Lead insertion through open thoracotomy under local anesthesia

Eliminates need for positive pressure ventilation during limited thoracotomy

Reduced risk of bleeding during lead insertion

A high degree of modularity and flexibility in pacing device design for each individual

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