JoVE Article Template:

TITLE

Catherization of the abdominal aorta and measuring the decrease of cardial inotropy due to ischemic cardiomyopathy created by LAD ligature in a rat model

Authors:

P. Piontek [1], A. Ghodsizad[2], V. Bordel[1], M. Karck [1], A. Ruhparwar[1]

Affiliation:

[1] Department of Cardiac Surgery, University of Heidelberg, Germany

[2] The Methodist Hospital, DeBakey Heart and Vascular Center, Texas Medical Center

Corresponding author:

Patricia Piontek

Keywords:

Catherization, abdominal aorta, LAD-ligation

Short Abstract:

We present how to induce ischemic cardiomyopathy in a rat model
by LAD ligation and the cathetarization of the abdominal aorta.

Long Abstract:

A worldwide spreading disease is heart failure. There are several cures for this condition.
Our project develops another approach by using artificial contractile meshes in order to enhance the cardiac contractability.
In order to test the enhancing effect of the contractile meshes a surgical procedure has to be done simulating a coronary syndrome / anterior myocardial infarction. Therefore, we induce infarction by the use of LAD ligation technique. The lowered blood pressure is measured by a catheter inserted in the abdominal aorta.
The procedure commences by preparation of the main airways followed by tracheotomy and intubation. Before and after inducing cardiomyopahty the blood pressure is measured by the means of a catheter inserted in the abdominal aorta. Subsequent to the measurement of the normal, healthy blood pressure a thoracotomy is conducted and a cardiomyopathy induced by ligature of the LAD.
By remeasuring the blood pressure we detect the resulting effects of cardiomyotpathy.

Text: should include a step-by-step description of the experimental procedure *(protocol)*. Describe procedures in sufficient detail so that the work can be reproduced. Please use complete sentences, and write with a style similar to the example below, so that the protocol sounds natural when read.

Part 1: Anesthesia and preparation of the surgery

1) Twelve- week- old male rats were supplied by the Heidelberg University Animal Research Facility. They were anesthetized with ketamin and xylazin intramuscularly.

2) Neck, thorax and abdomen are shaved

3) The animal is placed onto an operating table with warming blanket

4) In order to prepare the trachea for an endotracheal intubation muscles and thyroid gland had to be put away.

5) With a small incision between the cartilages an opening for the intubation tube was created.

6) The tube was inserted in the trachea and fixed.

7) The rats were intubated endotracheally and ventilated with a rodent ventilator (Harvard Apparatus). Inhalational anesthesia was maintained with isoflurane.

Part 2: Incision and exposure of the thorax and abdomen

1) The abdomen was opened by a middle incision following the linea alba.

2) Intestines were taken out of the abdominal cavity to gain adequate exposure of the abdominal aorta and moistened.

3) At this step the abdominal aorta could be prepared and catheterized as follows:

first two clips in distance of about two centimetres have been attached to the abdominal aorta.
Between the two clips an incision was made that allowed to introduce the catheter into the lumen of the aorta.
After insertion, the upper clip was removed and the catheter pushed softly forward so that the blood pressure could be measured.

4) For anticoagulation of the catheter Heparin was used.

5) To induce myocardial infarction a letaral thoracotomy was perfomed

6) a 7-0 ethicon ligature was placed around the left descending coronary artery just below the atrioventricular border.

7) A repeated measuring of the blood pressure allows to register the reduced inotropy.

Discussion:

Our project focusses on enhancing the cardiac contractibility by using artificial contractile meshes. We use the left anterior descending coronary artery(LAD) ligation technique, to create a heart failure model. The aim is to achieve a lower cardiac output with subsequent decrease in blood pressure measured by the insertion of a catheter through the abdominal aorta. This setting allows to test the contributive effect of different supportive contractile cardiac wrapping techniques. These include the application of tissue engineered contractile meshes, which we have been working on. So we have provided an optimal heart failure model in small animals which allows the assessment of promising systems for cardiac support.

By attaching or connecting unloading contractile devices including artificial meshes to the failing left ventricle, small changes in the detected blood pressure can be registered and examined. So we will be able to recognize minimal changes of the contractile ability of the heart. This model provides a bright platform for future heart failure experiments.

Table of specific reagents and equipment:

Name of the reagent	Company	Catalogue number	Comments (optional)
Ketaminhydrochlorid	CP-Pharma, Burgdorf		
Xylazin	Bayer, Leverkusen		