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SPARC Pig1 acute wired ColoMOCA implantation

Dennis Bourbeau[1], Brett Hanzlicek[2], Margot Damaser[3]

[1]MetroHealth Medical Center, Cleveland, Ohio; [2]Advanced Platform Technology Center, Louis Stokes VA Hospital, Cleveland, Ohio; [3]Department of Biomedical Engineering, Cleveland Clinic Lerner Research Institute, Cleveland, Ohio

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SPARC
Tech. support email: info@neuinfo.org

Brett Hanzlicek

SUBMIT TO PLOS ONE

ABSTRACT

In this study, we will be using Yorkshire Pigs, 50-70kg. The purpose of this study is to develop a tool to measure bowel fullness and activity. This system will eventually be able to provide continuous, wireless, battery–powered data and ultimately be translated for use in research and clinicalapplications of bowel function. We will measure porcine bowel compliance, pressures, and dimensions in acute live animal studies.

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MATERIALS TEXT

Artificial stool - 2:1:1 potato flour, oat bran, saline
Mixed with 5:1 saline-diluted contrast dye
Use different concentrations of saline to match lower range and upper range of natural stool impedance (2 levels)
Volume sufficient to cover sensor in rectum, approximately 20 cm in length

BEFORE STARTING

No fasting is required.

Anesthesia Preparation

Anesthesia Preparation

1

Pigs will be initially anesthetized with an intramuscular dose of telazol (4.4–6.6 mg/kg). The animals will then be intubated orotracheally and maintained on isoflurane in oxygen (1-5%; depending on anesthetic depth). Anesthetic depth will be measured by the response to stimulus, heart rate, respiratory rate and eye position.

A peripheral catheter will be placed in an auricular vein for administration of fluids. Buprenorphine may be administered IM or IV (0.02–0.1 mg/kg).

Surgical Preparation

2 **Surgical Preparation**

After anesthesia preparation, place the pig in a supine position. Insert a urine catheter with help of a guidewire and tape the catheter to side of the pig. The catheter reduces pressure that a bladder with urine would put on the colon.

We use a 10F Dover catheter (Covidien; Catalog # 8887603101)

3 **Calibrate air-charged anorectal manometry catheter** (Laborie T-DOC) on benchtop.
This catheter consists of a large balloon for rectal pressure and small balloons to collect anal sphincter pressure.

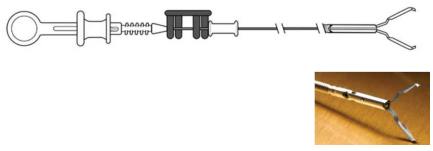
Laborie T_DOC anorectal manometry catheter

Intrarectal Testing

4 **Insert speculum** (anoscope) approximately 10 cm into the rectum **and remove stool.**
Empty the bowel of stools by manual disimpaction.

5 **Measure stools and bowel**
-Measure the size of the stools, including diameter and length.
-Measure the dimensions of the colon, rectum, and anus, including diameters and lengths.

6 **Insert ColoMOCA** into the rectum through an anoscope using a mucosal tool (Boston Scientific Resolution Clip) with clip. Deploy clip to attach the ColoMOCA to the mucosa of the rectum.
-Place the clip around the "handle"/loop of the ColoMOCA, insert into the rectum and deploy clip.



Boston Scientific Resolution Clip

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7 **Test for signal from the ColoMOCA.**
-The ColoMOCA is powered using wires that run to a power supply. The ColoMOCA collects pressure data using 2 pressure transducers. The device also collects conductance, conductivity and capacitance measurements using 4 electrodes that are attached to the device. All data are wirelessly transmitted to a receiving coil (chataMOCA) outside of the body, which is connected to a laptop. The data is visualized and collected using Labview software.

8 **Press on abdomen.**
-After confirming that the chataMOCA is receiving a wireless signal from the ColoMOCA, press (2-3 seconds) down on the lower abdomen where the ColoMOCA is (internally) attached.
-Confirm pressure response from ColoMOCA

9 **Remove anoscope and press lower abdomen again.**
-Confirm pressure response from ColoMOCA

10 **Insert T-DOC Balloon catheter for reference pressure; add 10 ml water to the large balloon.**
-The pressure as measured through the balloon catheter will be recorded as a function of volume infused into the balloon catheter, which will be used to calculate the bowel compliance. The balloon pressure will also be used as reference pressure for the ColoMOCA.

11 **Press on lower abdomen multiple times** and record balloon and ColoMOCA pressure.
-Balloon catheter responding
-Wait around 30 seconds between presses

12 **Remove balloon catheter.**
-Device still in the rectum

13 **Setting up conductivity testing.**
-Conductivity, conducatance and capacitance testing is performed using 4 electrode on the ColoMOCA in response to the device being in contact with real and artificial stool.

14 **Insert anoscope then insert real stool** through the anoscope onto the ColoMOCA.

15 **Press on abdomen multiple times**, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA

16 **Remove real stool Press on abdomen** multiple times, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA

17 **Repeat steps 15 and 16.**

18 **Insert Artificial Stool** into the rectum, onto the ColoMOCA.

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19 **Press on abdomen multiple times**, 2-3 seconds each
-Record pressure and electrode data from the ColoMOCA

20 **Remove artificail stool. Press on abdomen multiple times**, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA

21 **Twist/rotate sensor** so that the pressure sensors are facing wall of the bowel proximal to the abdomen. Press on abdomen multiple times, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA

22 **Rotate sensor** so that the pressure sensors are facing away from the pressure from the abdomen. Press on abdomen multiple times, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA

23 **Insert balloon catheter approximately 2 cm into rectum** and inflate with 10ml water.

24 **Press on abdomen** multiple times, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA and pressure data from the balloon catheter.

25 **Rotate sensor** so that the pressure sensors are facing wall of the bowel proximal to the abdomen. Press on abdomen multiple times, 2-3 seconds each.
-Record pressure and electrode data from the ColoMOCA and pressure data from the balloon catheter.

26 **Remove balloon catheter and ColoMOCA.**

Euthanasia

27 **Euathanize pig** with Beuthanasia (100mg/kg IV)

Post Mortem

28 **Measure colon and stool dimensions**, including thickness and impedances

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