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SPARC Pig2 acute wired ColoMOCA implantation

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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.

Attach monitor sensors (BP, pulse Ox, EKG, Temp)

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.

Clean the (midline suprapubic) incision area using Betadine solution and isolate the area using sterile towels.

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 Tesing

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

5 **Insert ColoMOCA into rectum.**
-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 is 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.

6 **Place receiving antenna (chataMOCA) on lower abdomen of pig.**
-Make sure we are receiving a wireless signal from the coloMOCA.

7 **Insert Laborie Balloon catheter** 5 cm into the rectum using surgilube and remove anoscope.
-The catheter has depth measurement printed on it.

8 **Pressing and hold (~5 sec) on lower pig abdomen.**

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-Record response of ColoMOCA pressure transducers using Labview
-Record pressure response from balloon catheter using Laborie software.

9 **Insert anoscope and then insert artificial stool** so that it is on top of the ColoMOCA. Remove anoscope.

10 **Collect pressure and electrode measurements from ColoMOCA** using artificial stool on top of ColoMOCA.
-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. We use conductance reading to approximate volume.

11 **Remove ColoMOCA.**

Laparotomy

12 **Start Laparotomy**
-With the animal in supine position, a midline suprapubic incision will be made to expose the peritoneal cavity and viscera.
The animal will then be transitioned from isoflurane anesthesia to an IV infusion cocktail of propofol (2.0–4.4 mg/kg/h), midazolam (0.4–0.7mg/kg/h) and fentanyl (0.003–0.005 mg/kg/h).

Intracolonic Testing

13 **Incise proximal colon**, distal from cecum, ~1cm long.

14 **Insert ColoMOCA into the bowel** through the incision.

15 **Insert balloon catheter** next to ColoMOCA for reference pressure.

16 **Pressurize balloon catheter** by filling the balloon with ~5 ml water.
-Record record pressure from catheter and ColoMOCA

17 **Close the abdomen.**

18 **Pressing and hold (~5 sec) on pig abdomen** where the ColoMOCA is implanted.
-Record pressure, volume, conductivity and capacitance measurements from the ColoMOCA and pressure measurements from the balloon catheter.

19 **Open abdomen and rotate the ColoMOCA** so that the pressure sensors are facing the wall of the colon.

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20 **Close abdomen.**

21 **Pressing and hold (~5 sec) on pig abdomen** where the ColoMOCA is implanted.
-Record pressure, volume, conductivity and capacitance measurements from the ColoMOCA and pressure measurements from the balloon catheter.

Euthansia

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

Post Mortem

23 **Measure colon and stool dimensions**, including thickness and impedances.

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