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#26	Refined laparoscopic sampling of the hepatic portal vein in adult Mangalitza pigs	Oliver James (1) Padraig Kelly (2) Ruth Morgan (3)	Edinburgh Univeristy (1) Edinburgh Univeristy (2) SRUC	Abstract

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Refined laparoscopic sampling of the hepatic portal vein in adult Mangalitza pigs

Oliver James, Edinburgh Univeristy
Padraig Kelly, Edinburgh Univeristy
Ruth Morgan,SRUC

Introduction

Hepatic portal vein (HPV) sampling in pigs is used in biomedical research for a variety of reasons including the study of nutrition, pharmacokinetics, metabolism and gut–liver interactions in health and disease. HPV sampling is most commonly achieved with an open laparotomy approach; however, this highly invasive approach increases the risk of surgical complications and animal welfare concerns. Laparoscopic approaches are described in miniature pigs but to our knowledge, there are no studies reporting laparoscopic sampling of the HPV in adult, full size pigs. Fatty pig breeds such as the Mangalitzas are of increasing interest in translational research due to their high visceral fat content and susceptibility to metabolic disease. In this study we describe the refinement of a minimally invasive HPV sampling method.

Methods

Twelve female, 6-month-old, Mangalitza pigs (52-70kg) underwent laparoscopic HPV sampling as part of a larger study. Each pig was sampled 3 times at 45-minute intervals. This surgical technique was refined throughout, here we describe the final iteration.

Animals were pre-medicated with medetomidine (7 µg/kg IM), ketamine (7 mg/kg IM), morphine (0.3 mg/kg IM) and midazolam (0.2 mcg/kg IM), and induced with isoflurane. Anaesthesia was maintained using isoflurane in an air/oxygen mix with partial intravenous anaesthesia (Ketamine 10 mcg/kg/min, and medetomidine 2.5 µg/kg/min). Analgesia and antimicrobials were provided; flunixin meglumine (2.2mg/kg IV), potentiated amoxicillin 20mcg/kg IV q90-120 min, then long-acting amoxicillin at end of procedure (15mg/kg IM).

The pigs were placed in left lateral recumbency in a reverse Trendelenburg position with mild sagittal rotation. Ultrasonography was used to identify the optimal laparoscopic portal location, located adjacent and 2cm caudal to the last rib, 8-10cm ventral to the kidney, overlying the caudal aspect of the liver. A 2cm vertical incision was made through the skin, subcutaneous fat and into the muscle. Under visual guidance (All-in-one Endoscope camera system, NSE Guangzhou, China) with a forward facing 10mm laparoscope (Karl Storz Hopkins 0 degree laparoscope, Tuttlingen, Germany) the 10mm Ternamian cannula (Karl Storz Ternamian EndoTIP System) is inserted and rotated in a corkscrew,

clockwise fashion through the externus abdominis oblique, internal abdominis oblique and transversus abdominis muscles and peritoneum. Once abdominal entry was confirmed, the abdomen was insufflated to ≤7 mmHg with CO2.

Under laparoscopic guidance, two instrument portals were created, following the line of the costal arch, 6 cm cranioventral and 12 cm cranioventral to the laparoscopic portal respectively. A laparoscopic fan retractor (Medeasy, Zhejianh, China) was inserted through the cranial portal, unfurled and used to elevate the right lateral and caudate lobes, exposing the HPV. A laparoscopic needle (pre-flushed with heparin) was inserted through the middle portal and used to sample the HPV.

The abdomen was exsufflated, trochars were maintained, but all instruments removed. After 45 minutes the abdomen was re-insufflated and the process repeated. Small haemorrhagic clots were dislodged from sampling site with the unfurled fan retractor, and sampling repeated.

Upon completion, the instruments were removed, the abdomen exsufflated and the dermis closed using 2-3 cruciate sutures at each portal. The surgical sites were covered with an adhesive dressing for recovery (Opsite, Smith-Nephew, Watford, UK).

Results

Sampling (5-10ml) of the HPV was achieved at 3 times points in all of the animals. Mean time from insufflation to collection of the HPV sample was 12 mins (+/- 4.3 mins). All the pigs recovered uneventfully from the surgery and only one required additional analgesia in the 12-hour post-operative period.

Inadvertent placement of the veruss needle led to insufflation of the thoracic cavity (n=1), stomach (n=1) and peri-renal fascia (n=1), there were no adverse effects noted in these animals. The technique was refined to utilise a veruss-free approach, no complications subsequently occurred.

Conclusions

The surgical approach has been refined to the current format. It was easy to perform and utilised routine surgical equipment. HPV sampling was successfully achieved in all pigs. Complications were minimal and there was a marked improvement in pig comfort levels and recovery compared to open laparotomy.