Rectal Prolapse as a Complication of Transrectal NOTES in an Experimental Porcine Model

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ABSTRACT

Background: Rectal prolapse is the protrusion of one or more layers of the rectum through the anal sphincter. Some of the possible causes are tenesmus, endoparasitism and large bowel inflammation. Natural orifice transluminal endoscopic surgery (NOTES) consists of advanced techniques to gain access to body cavities through natural openings without skin incision. Different access routes may be used. However, transrectal NOTES has not been often reported. This paper reports a case of rectal prolapse after transrectal NOTES in a porcine model.

Case: A healthy, female domestic swine underwent experimental peritoneoscopy through transrectal route. The animal weighed 20 kg and was approximately 90 days old. Under general anesthesia, a pneumoperitoneum was created and, after this, the rectal lining was pulled out and incised so that the endoscope could be introduced into the abdominal cavity. Subsequently, the cavity was deflated and the rectal wall was sutured under direct viewing with single-layer extramucosal sutures closed with 3-0 polyglactin 910 and simple continuous pattern in the muscular region and submucosa. There was edema of the rectal lining with a slight protrusion and was reduced manually. There was prolapse recurrence and a purse-string suture was placed around the anus. The suture ruptured about 72 h after the endoscopic procedure and self-mutilation of the perineal region aggravated the animal’s condition. The swine was then euthanized.

Discussion: The external exposure of the animal’s rectal lining immediately after the surgical procedure initially suggested incomplete or mucosal rectal prolapse because, in such cases, only rectal lining protrudes out of the anus insofar as any portion of the anal circumference may be affected. The probable cause of the rectal prolapse in this case may be related to the incision performed in the rectal wall, which might have reached branches of the cranial rectal artery and/or caudal mesenteric artery, which supply the distal rectum. C-reactive protein level is used as an early marker of inflammation. The levels of this inflammatory biomarker in this animal confirmed an increased acute inflammatory response because there was a significant increase in the level of C-reactive protein 24 h after the procedure when compared with baseline level (baseline level: 0.34 mg/L-1; 24-h level: 2.36 mg/L-1). C-reactive protein remained increased 48 h after the surgery (2.17 mg/L-1), even after the animal received anti-inflammatory drugs daily. The prolapse was manually reduced without surgery during the immediate postoperative period. Prolapse recurrence occurred 24 h after the endoscopy. Therefore, the animal was anesthetized again for the performance of a purse-string suture technique around the anus. The authors believe that the reason for the animal’s self-mutilation in the perineal region was discomfort and/or itching in the rectal region due to the suture in the rectum. This may have caused the rupture of the purse-string suture with consequent self-mutilation and trauma of the perineal region. In these situations, the prognosis becomes reserved or unfavorable. The authors decided for euthanasia based on the severity of the injury and because the animal had undergone an experimental procedure. Therefore, transrectal NOTES may be a promising method, nevertheless, further experimental studies should be conducted to investigate its complications, including the possibility of rectal prolapse.

Keywords: rectal access, endoscopic surgery, scarless surgery, rectal injury, peritoneoscopy.
INTRODUCTION

Rectal prolapse consists of invagination of the rectal wall in the distal region of the large intestine [7]. There are cases of partial rectal prolapse, when only the inner lining of the rectal mucosa protrudes out of the anus, or complete rectal prolapse, when all layers of the rectum protrude out of the anal orifice [1].

This exposure of the rectal lining to the external environment may be caused by varied factors, such as tenesmus, urogenital or anorectal surgery, endoparasitism, typhlitis, colitis, proctitis, neoplasms, and foreign bodies [1,6].

Endoscopic surgery consists of a minimally invasive surgical approach using an endoscope to view internal structures. Several different routes of access to body cavities have been investigated for this surgical technique, such as transgastric, transvaginal, transurethral, transcolonic, and transrectal, which has been little studied [2].

There are few clinical and experimental studies on the use of transrectal route for NOTES [6]. Therefore, reports on complications related to the use of this route in different species is an important step to increase our knowledge about this new route of access for endoscopic surgery.

In view of this, the aim of this study was to describe a case of rectal prolapse in a female swine that underwent NOTES.

CASE

A healthy, female domestic swine (Sus scrofa domestica) underwent experimental peritoneoscopy through transrectal route. The animal weighed 20 kg and was approximately 90 days old.

Bowel preparation consisted of gradual reduction of the amount of feed and solid and liquid fasting for 20h. Bowel cleansing consisted of orally administered bisacodyl 0.5 mg/kg⁻¹ and 0.5% mannitol 20% 10 mL/kg⁻¹ 48 and 24 h before the surgery.

After introducing a Veress needle under general anesthesia, pneumoperitoneum was performed with carbon dioxide at a pressure of 12 mmHg and a flow rate of 2 L/min. The animal was placed in left lateral decubitus position. The rectal lining was pulled out and incised so that the flexible endoscope [9], could be introduced into the abdominal cavity for 15 min. Subsequently, the cavity was deflated and the rectal wall was sutured using polyglactin 910 in a continuous simple pattern in the muscular region and submucosa.

After suturing the rectum, there was mild edema and protrusion of the rectal lining. This complication was reduced using lidocaine gel to lubricate the region and cold saline to wash it. Postoperatively, the animal received tramadol 3 mg/kg⁻¹ orally (bid, 3 days); meloxicam 0.1 mg/kg⁻¹ orally (sid, 2 days), and the rectal lining was washed using 0.9% solution of NaCl.

Serum level of C-reactive protein was measured before the surgery, as well as 24 and 48 h after the surgery. Two days after the NOTES procedure, a purse-string suture was placed around the anus under general anesthesia using a 2-0 nylon thread. The suture was ruptured 72 h after the endoscopic procedure (Figure 1). There was self-mutilation of the perineal region and the rectum. Therefore, the animal was euthanized 72 h after the NOTES procedure.

Figure 1. Rectal prolapse in a swine that underwent transrectal NOTES acces.

DISCUSSION

The external exposure of the animal’s rectal lining immediately after the surgical procedure initially suggested incomplete or mucosal rectal prolapse [1,6].

The probable cause of the rectal prolapse in this case may be related to the incision performed in the rectal wall, which might have reached branches of the cranial rectal artery and/or caudal mesenteric artery, which supply the distal rectum [5]. The possible reason to explain this event might be a major initial local inflammation, causing edema of the rectal lining and making it to protrude out of the anus.

The levels of C-reactive protein in the animal model confirmed an increased acute inflammatory response [8] because there was a significant increase in
the level 24 h after the procedure when compared with baseline level (baseline level: 0.34 mg/L⁻¹; 24-h level: 2.36 mg/L⁻¹). This inflammatory biomarker remained increased 48 h after the surgery (2.17 mg/L⁻¹), even after the animal received anti-inflammatory drugs daily.

After lubricating and washing the rectal lining using cooled 0.9% solution of NaCl, there was partial reduction of the edema. Thus, it was manually reduced with no need of surgery during the immediate postoperative period.

The authors believe that the reason for the animal’s self-mutilation in the perineal region was discomfort and/or itching in the rectal region because of the suture in the rectum. This may have cause the rupture of the purse-string suture with consequent self-mutilation and trauma of the perineal region. In these situations, the prognosis becomes guarded or unfavorable [1]. The authors decided for euthanasia based on the severity of the injury and because the animal had undergone an experimental procedure.

Therefore, transrectal NOTES may be a promising method. Nevertheless, further experimental studies should be conducted to investigate its complications, including the possibility of rectal prolapse.

Ethical Approval. This study was assessed by the Animal Ethics Committee (AEC) of the Universidade Federal do Rio Grande do Sul (UFRGS), under protocol number 23376.

Declaration of interest. The authors declared no potential conflicts of interest with respected to the research, authorship and/or publication of this article.

REFERENCES