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Clinical Report

# Hernioplasty with polypropylene implant after an abdominal trauma of a pregnant cat

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The incidence of accidents with cats and its consequences on the health of these animals have been reported frequently in the literature. The abdominal hernia is an example of a condition developed as a result of trauma. Abdominal hernia is a defect of the inner wall of the abdomen that can allow part of the abdominal contents to protrude. In this case report, a pregnant cat has developed an abdominal hernia after disappearing for a week. The animal was clinically well, but the abdominal volume was considerable. Surgical intervention was necessary as soon as possible, because it was an irreducible hernia. A significant amount of devitalized muscle tissue and fragile tissue were observed. Because of the abdominal necrosis, there was no possibility to perform conventional suturing technique in the abdominal wall to correct the hernia. It was necessary to apply a polypropylene mesh implant, which is anchored by means of simple interrupted stitches. Besides hernioplasty, a lumpectomy and ovariohysterectomy were performed due to the presence of a suppurative inflammation of the mammary glands and fetal maceration in the uterus. The review of the patient, after 10 days, revealed no signs of infection of the surgical wound and the implant remained stable. The patient continued feeding and drinking water normally. The goal of this study is to describe the surgical technique of hernia repair using polypropylene implant in a cat that has lost approximately 50% of the abdominal muscle tissue caused by an abdominal trauma.

## INTRODUCTION

Abdominal hernias generally occur due to trauma, for example, vehicular accidents, falls from high places or fights with other animals. Intra-abdominal pressure increases as the abdominal muscles are contracted, which can cause the rupture of the inner wall, resulting in a hernia (LANE et al., 2003). The abdominal hernia is basically a defect of the inner wall of the abdomen, which may enable the protrusion of the abdominal content producing the features of an external abdominal hernia. Internal abdominal hernias are characterized by displacement through a confined ring of tissue within the abdomen or chest, for example, diaphragmatic or hiatal hernia (DIETERICH, 1975).

Through physical examination of the animals that exhibit this type of hernia, it is possible to identify an asymmetry in the abdominal shape. By palpation it is possible to distinguish different structures and organs as well as locate the abdominal defect (SLATTER, 2008). The diagnosis is usually based on the combination of physical examination and ultrasound examination. Additional x-ray examination will render identification of

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associated injuries and the definition of the components of hernias (KEALY, 2012).

Most hernias can be corrected by suturing the ends of the ruptured muscle. Some synthetic mesh can be used in the repair of some major defects, which consists of performing a hernioplasty. There are numerous types of implants on the market, of which polypropylene being the most used in veterinary practice (LAMPERT et al., 2009). The aim of this study is to describe and discuss the surgical technique of hernia repair using polypropylene implant in a pregnant cat that lost approximately 50% of the abdominal muscle tissue.

## CASE REPORT

A one-year old, crossbred female cat weighing 2,55kg was attended to in a veterinary clinic in Fortaleza-CE. The animal was taken to the veterinary medical care because of an increased abdominal volume was noticed when the cat returned home after having been missing for a week. The cat was pregnant, approximately 30 days of gestation, according to the owner. Physical examination revealed slightly pale mucous membranes, normal capillary refill time, normal lymph nodes, heart rate (170 beats / min) and breathing (20 breaths / min) according to expectation for a feline, cardiac and pulmonary auscultation were unchanged, normal temperature, loss of appetite and hypodipsia. The absence of ectoparasites, immunizations and deworming were all acceptable.

Following abdominal palpation, it was determined that the increased abdominal volume was due to herniation of the peritoneal content through the abdominal wall. However, the cat had no obvious pain and the content was not manually reducible. Also an increase in the volume of inguinal mammary glands was seen. Blood samples were collected to perform the complete blood count (CBC), alanine aminotransferase enzyme (ALT) and creatinine. Ultrasonography and cytology of mammary gland by aspiration with fine needle (FNA) were also performed.

CBC showed increased monocytes (1,350 cells/µL vs. normal 0-850 cells/µ*L*). ALT (288 U/L vs. normal 10-100 U/L) was increased. Cytological examination of the mammary gland revealed a suppurative inflammation. Ultrasonography revealed hepatomegaly and fetal death. Heterogeneous content compatible with omentum and intestinal loops in the herniated region was also observed. After the clinical examination and the results of laboratory tests, it was recommended to the owners the following surgical procedures: ovariosalpingohysterectomy (OSH), lumpectomy and abdominal hernia repair.

Prior to surgery a Ringer's lactate drip for the replacement of fluids and electrolytes via the cephalic vein was performed. In addition, tramadol (4mg/kg, IM, t.i.d.), meloxicam (0.1mg/kg, SC, s.i.d.) and ceftriaxone (50mg/kg, IV, b.i.d.) were administered to provide analgesia, reduce inflammation and eradicate ongoing infection.

On the following day, the patient was taken to the pre-operating room, where the anesthetic premedications: acepromazine (0.1mg/kg, IM), atropine (0.02mg/kg, IM) and Tramadol (2mg/kg, IM) were administered. After the premedication, trichotomy was performed on the entire abdominal region and medial region of the hind legs. Then the cat was taken to the operating room where she was anesthetized with propofol (4mg/kg, IV), intubated with number 3.5 probe and maintained in anesthesia with isoflurane vaporized with 100% oxygen in an open system with Baraka. Cardiac parameters were monitored with electrocardiogram. Finger capnography and oximetry were also used. Data on blood pressure and temperature were available in real time. In the transoperative phase, fentanyl citrate (0.005mg/kg, IV) was applied to aid analgesia and metronidazole (50mg/kg, IV) as the antibiotic of choice.

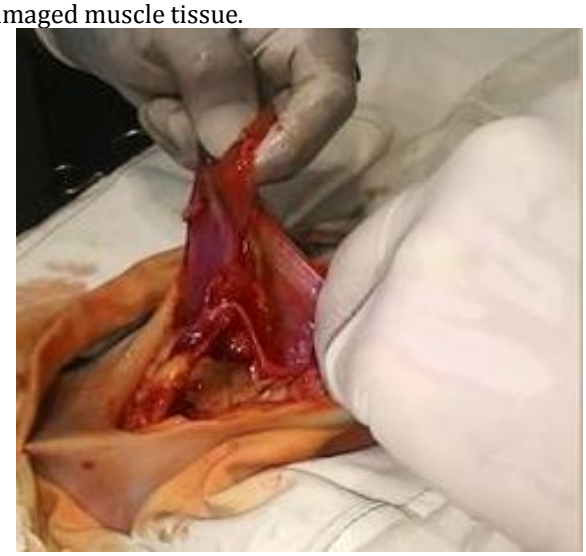
In the operating room, the patient was placed on the table in dorsal decubitus position. Antisepsis of the operative region with chlorhexidine 2% was performed and the draping was placed by the surgeon and fixed with Backhaus clamps. With a scalpel, the surgeon performed a skin and subcutaneous incision along the abdominal midline from the umbilicus scar to the inguinal region. A significant amount of devitalized muscle tissue, necrotic regions and fragile tissue were observed (Figure 1). Due to the abdominal necrosis, there were no possibility to perform conventional suturing technique in the abdominal wall to correct the hernia. In addition, peritonitis was observed. Conventional ovariohysterectomy was accomplished via abdominal access and lumpectomy by excision with scalpel, only in the mammary gland with suppurative inflammation.

For hernia therapy, the necrotic and devitalized tissue were removed, which turned out to be approximately 50% of the abdominal muscle. Due to the significant loss of abdominal muscles, it was necessary to apply a polypropylene mesh implant (Marlex®), which is anchored by means of simple interrupted stitches with nylon thread 3-0 in regions where there was a trace of viable muscle (Figure 2). The abdominal cavity was washed with approximately 1000 mL of 0.9% saline solution. The subcutaneous space was reduced with polyglactin 910 3-0 (Vicryl™) using the intradermal technique and the skin was sutured with nylon thread 3-0 using the Wolff technique.

After surgery, the animal remained hospitalized for three days. During this period, daily physical examination of the patient for early identification of any complication in

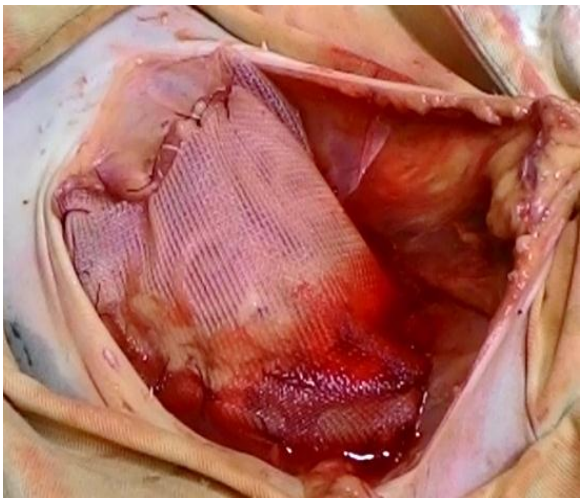
the postoperative period was performed. At the three days of hospitalization, ceftriaxone (50mg/kg, IV, b.i.d.), metronidazole (25mg/kg, IV, b.i.d.), meloxicam (0.1mg/kg, SC, s.i.d.) and tramadol (4mg/kg, IM, t.i.d.) were administered. Also a pressure dressing was changed daily to aid the surgical wound cleaning. This was initially performed with chlorhexidine 1% and then DM Gel® (escin solution, dimethylsulfoxide, dexamethasone, prednisolone, lidocaine) and Furanil® ointment (chlorhexidine). After discharge, cephalexin (30mg/kg, PO, b.i.d.) for 10 days and metronidazole (25mg/kg, PO, b.i.d.) for 7 days were prescribed. In addition, complete rest, space restriction and return in 10 days for review and withdrawal of points were recommended. The review revealed no signs of infection of the surgical wound and the implant remained stable. The patient continued feeding and drinking water normally.

Figure 1 – Observe significant amount of devitalized and damaged muscle tissue.



Source: Author's collection.

Figure 2 – Placing of polypropylene mesh implant that was anchored with simple interrupted stitch. Author's collection.



Source: Author's collection.

## DISCUSSION

According to Damschen et al. (1994), abdominal hernias are more common in young cats and there is usually a history of trauma. The cat of this report fits the description both for being a young animal, only a year old, but also because of the possible trauma that it suffered during the period the cat was missing. Approximately 75% of the animals who suffer trauma that involves vehicles, concussions and falls, have other significant injuries (SLATTER, 2008). However, the cat of this report did not present any complication related to orthopedic disorders, respiratory or gastrointestinal system changes.

Abdominal hernias can be classified as true and false. The true hernia is characterized by protrusion of the peritoneal viscera and the presence of a hernial ring. False hernias are characterized by the protrusion of organs but do not contain the complete peritoneal sac and the absence of the hernia ring (DIETERICH, 1975). In the description of the case report, the hernia was classified as false. In the absence of the peritoneal lining, the content of false hernias is under a considerable risk of adhesion of organs and tissues. Moreover, the occurrence of tissue inflammation and stenosis of the blood supply of the structures involved are more likely to occur (AYDOS, 1999; KRAUS 1996). These data are in accordance with what happened in the report of this study, since severe inflammation and necrosis of the mesentery and muscle tissue were observed.

On physical examination, it is known that increased abdominal volume is not necessarily equivalent to the size of the herniation, especially when the intestine is herniated. Therefore, careful palpation is recommended so that the hernia contents can be distinguished from the different types of structures and organs (KRAUS, 1996). In addition, through palpation, there is the opportunity to reduce the contents of the hernia into the abdominal cavity, identify the exact location and size of the hernia and recognize signs of pain or temperature rise. If the components are irreducible, the strangulation or bowel obstruction can possibly happen, requiring surgical intervention as soon as possible (FOSSUM, 2015). Due to the irreducibility of the cat´s hernia components in this study, even without the presence of pain, surgical therapy was instituted as soon as possible after the results of laboratory tests, in order to avoid further complications.

The monocytosis, which was observed in the cat's CBC could be explained by the presence of necrosis of the muscle tissue and mesenteric inflammation. Necrosis of muscle tissue may also be the reason for an increased ALT (LOPES et al., 2007). In the ultrasonography, hepatomegaly was observed that could be related to the hyperplasia of mononuclear phagocytic system, since the

demand for monocytes was significantly increased (WATSON, 2015).

FNA demonstrated a suppurative inflammatory process, lumpectomy was performed, which consists of excision of the mammary gland tissue and a border of variable size greater than 1 cm (SLATTER, 2008). The Salpingo-oophorectomy was performed after opening the abdominal cavity. There was no possibility of fetal survival, as demonstrated by ultrasound and confirmed after opening the abdominal cavity. Fetal death may have been caused either by trauma itself or due to the herniation of abdominal contents, causing dystocia or toxemic pyometra (FOSSUM, 2015). Furthermore, the widespread secondary peritonitis that was observed was probably due to mesenteric avulsion resulting from post-traumatic herniation. It has been shown that peritonitis often does not cause clinical signs up to 7 days after injury and it is known that cats are less sensitive to pain than dogs (COSTELLO et al., 2004).

Non absorbable sutures were used to correct the abdominal hernia because these materials maintain tensile strength for more than 1 year (FOSSUM, 2015). There are studies that report the successful use of absorbable materials in hernia repair (LEAL et al., 2014; SILVA et al., 2009). However, it is necessary to evaluate each case and decide whether or not to use certain materials. There are different biomaterials, whether synthetic or biological nature, with a variable results and complications. About 80 types of meshes are available for the repair of abdominal hernias, ranging from polypropylene to expanded polytetrafluoroethylene, the latter being more flexible and microporous, providing minimal inflammatory reaction and fewer adhesions (MILLIKAN, 2003).

The synthetic mesh used in this report was the Marlex® mesh polypropylene. The polypropylene implant has the characteristic of being monofilament, it tolerates well the presence of infection when compared to other synthetic meshes, since the small pores decrease the opportunity for bacterial growth (MILLIKAN, 2003). In addition, polypropylene mesh remains soft and flexible and it is not subject to weakening by the action of enzymes, providing a suitable frame for the deposition of collagen and embedding adjacent tissues (BELLON et al., 1998). However, according to Araújo et al. (2010), the inflammatory process is more intense in animals that have received polypropylene implants when compared to the receptors that have attached biological biomaterials. There is also a higher possibility of adhesion formation.

Although many studies have shown that the use of polypropylene mesh can lead to the development of an excessive fibrosis, visceral adhesions, formation of enterocutaneous fistulas, deformation and migration of the prosthesis, nowadays this material is the most used both in veterinary and human medicine (BELLOWS; ALDER; HELTON, 2006; LAMPERT et al., 2009; NGO et al., 2011). This is due to a greater availability of polypropylene mesh, is one of the most well studied techniques and most commonly used to solve the problem (SHOUKRY, 1997). There are few studies concerning different types of biological materials, making many professional no longer play, despite the increasing number of procedures performed with these materials both in human and veterinary medicine (OLIVEIRA et al, 2009; SINGH et al ., 2008).

It is recommended placing a drain in the wound, which increases up to 76% the success rate in the cases of polypropylene mesh implantation (MEFIRE; GUIFO, 2011). In this study, the placement of a catheter was found to be unnecessary, leaving the patient under observation and, if any sign of infection had appeared, draining of the wound would be performed. In the present case report, no clinical signs of inflammation or abdominal discomfort was detected 10 days after surgical implantation of polypropylene mesh. However, a better evaluation for more specific methods would be required, such as ultrasound, to assess more accurately the abdominal contents and the presence of inflammation and edema.

## CONCLUSION

In this case, the abdominal hernia repair technique using a polypropylene implant has proven to be a relatively simple procedure that gives positive results with regard to the recovery of the patient and the absence of postoperative complications when performed with the proper technique.

## REFERENCES

ARAÚJO, U. R. M. et al. Escolha do material da tela para disposição intra-peritoneal na correção cirúrgica de defeitos herniários da parede abdominal. **Arquivos Brasileiros de Cirurgia Digestiva**, v. 23, n. 2, p. 118-121, 2010.

AYDOS, R. D. et al. Estudo comparativo do efeito das telas de politetrafluoroetileno expandido e de polipropileno, colocadas por laparoscopia, em hérnias ventrais produzidas em coelhos. **Acta Cirúrgica Brasileira**, v. 14, n. 2, p. 59-64, 1999.

BELLOWS, C. F.; ALDER, A.; HELTON, W. S. Abdominal wall reconstruction using biological tissue grafts: present status and future opportunities. **Expert Review of Medical Devices**, v. 3, n. 5, p. 657-675, 2006.

BELLON, J. M. et al. Tissue response to polypropylene meshes used in the repair of abdominal wall defects. **Biomaterials Survey**, v. 19, n. 7, p. 669-75, 1998.

COSTELLO, M. F. et al. Underlying cause, pathophysiologic abnormalities, and response to treatment in cats with septic peritonitis: 51 cases (1990-2001). **Journal of American Veterinary Medical Association**, v. 225, n. 6, p. 897-902, 2004.

DAMSCHEN, D. D. et al. Acute traumatic abdominal hernia: case reports. **Journal of Trauma**, v. 36, n. 2, p. 273-276, 1994.

DIETERICH, H. F. Hernia repair in the canine. **Veterinary Clinics of North America Small Animal Practice. Philadelphia**, v.5, p. 383-399, 1975.

FOSSUM, W. T. Cirurgia da Cavidade Abdominal. In: Theresa Welch Fossum. (Ed.4). **Cirurgia de Pequenos Animais.** Rio de Janeiro: Elsevier, 2015. Cap. 19, p. 356-385.

KEALY, J. K.; GRAHAM, J. P.; MCALLISTER, H. (Ed.5). **Radiografia e ultrassonografia do cão e do gato.** São Paulo: Elsevier, 2012. p. 508.

KRAUS, K. H. Hérnias. In BOJRAB, M. J. (Ed.3). **Técnicas atuais em cirurgia de pequenos animais**. Rio de Janeiro: Rocha, 1996. Cap. 34, p. 410-424.

LAMPERT, J. N. et al. Repair of abdominal wall defects with bovine pericardium. **The American Journal of Surgery**, v. 198, n. 5, p. e60-e65, 2009.

LANE, C. T.; COHEN, A. J.; CINAT, M. E. Management of traumatic abdominal wall hernia. **American Surgery**, v. 69, p. 73-76, 2003.

LEAL, L. M.; The use of paca peritoneum preserved in supersaturated sugar solution 300% or glycerine 98% implanted in the abdominal wall of rats. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 66, n. 5, p. 1383-1391, 2014.

LOPES, S. T. A.; BIONDO, A. W.; SANTOS, A. P. (Ed.3). **Manual de Patologia Clínica Veterinária.** Santa Maria: UFSM/Departamento de Clínica de Pequenos Animais, 2007. p. 33.

MEFIRE, A. C.; GUIFO, M. L. Don´t be scared: insert a mesh. **Pan African Medical Journal**, v. 10, n. 18, 2011.

MILLIKAN, K. W. Incisional hernia repair. **Surgical Clinics of North America**, v. 83, p. 1223-1234, 2003.

NGO, M. D. et al. Evaluation of human acellular dermis versus porcine acellular dermis in an in vivo model for incisional hernia repair. **Cell Tissue Bank**, v. 12, p. 135-145, 2011.

OLIVEIRA, L. L. et al. Métodos de preservação de membranas biológicas para uso cirúrgico. **Jornal Brasileiro de Ciência Animal**, v. 2, n. 3, p. 175-188, 2009.

SLATTER, D. (Ed.3). **Manual de Cirurgia de Pequenos Animais**. São Paulo: Manole, 2008. p. 373.

SHOUKRY, M. et al. Commercial polyester fabric repair of abdominal hernias and defects. **Vet Record**, v. 140, p. 606-607, 1997.

SILVA, L. A. F. et al. Hernioplasty experimentalem coelhos por meio de cartilagem auricular bovina conservada em glutaraldeído. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 61, p. 606-612, 2009.

SINGH, J. et al. Acellular biomaterials of porcine origin for the reconstruction of abdominal wall defects in rabbits. **Trends in Biomaterials & Artificial Organs** , v. 22, n. 1, p. 34-44, 2008.

WATSON, P. J. Doenças hepatobiliares e do pâncreas exócrino. In: NELSON, R. W.; COUTO, C. G. (Ed. 5). **Medicina Interna de Pequenos Animais.** Rio de Janeiro: Elsevier, 2015. cap. 35, p. 501-511.