

# SYMPTOMATIC REPONIBLE UMBILICAL HERNIA IN THE RABBIT

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➤ Supporting Information

**ABSTRACT:** A case of umbilical hernia in a 7-month-old female rabbit was presented to the Surgery Clinic of the Veterinary Faculty, University of Sarajevo. The owner noticed inappetence and lethargy four days before arrival at the clinic. Clinical parameters on physical examination were within the physiological range. Bruxism and lethargy were noted as signs of discomfort due to gas accumulation in colon. A reponible, nonpainful mass in the umbilical scar area was palpated but intestinal peristalsis was not altered. General anesthesia was induced by intramuscular administration of ketamine with medetomidine and maintained with isoflurane. Surgical treatment of hernia included the peritoneal sac dissection and amputation, repositioning of small intestines, and correction of abdominal wall defect. Intraoperative multimodal analgesia approach was used to reduce inhalant anesthesia requirements and to prevent pain-related and stress-related complications. In this case report we described a surgical and veterinary treatment of the reponible umbilical hernia in a rabbit.

**Keywords:** Herniorrhaphy, Rabbit, Umbilical hernia, Veterinary treatment

**CASE REPORT**  
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## INTRODUCTION

Hernias are uncommon pathological findings in laboratory animals. It frequently occurs in domestic animals, such as foals, pigs, calves, and dogs (Monsang et al., 2014). Hernia represents a protrusion of abdominal content through the defect caused by tearing in the abdominal wall or natural abdominal opening (Lassandro et al., 2011, Monsang et al., 2014, Temple, 2018, Yang et al., 2019). Umbilical hernias in animals have a genetic component that can lead to improper closure of the umbilicus at birth or weakened supportive muscles around the umbilicus. Furthermore, it can occur due to cutting the umbilical cord too close to the abdominal wall. Its size varies depending on the umbilical defect and hernia content (Sutradhar et al., 2009, Monsang et al., 2014). During the clinical examination, umbilical hernias are usually represented as a soft mass ventral on the abdomen at the umbilical scar. The umbilical ring can be palpated by deep palpation but not necessarily (Fossum, 2013). Besides clinical examination, radiographs and ultrasound should be used for definitive diagnosis and hernia content determination (Grunkemeyer et al., 2010, Fossum, 2013). In cases where intestine segments are part of the hernia content, the formation of adhesions is most common due to the stimulative adhesive effect in its contact with the skin. That can lead to abnormal digestion primarily due to intestinal strangulation or obstruction. In such cases, the hernia is usually warm and painful, and the content is irreducible (Grunkemeyer et al., 2010, Fossum, 2013, Monsang et al., 2014). Signs of gastrointestinal pain in rabbits are anorexia, weight loss, improper defecation, and depression. In such cases, dehydration usually leads to generalized ileus and aggressive medical treatment is recommended (Reusch, 2005).

Many umbilical hernias can be spontaneously resolved at an early age. Otherwise, it is essential to correct any hernia as soon as possible (Fossum, 2013, Monsang et al., 2014), and herniorrhaphy is recommended corrective method (Grunkemeyer et al., 2010). The most common postoperative complications are hernia recurrence and surgical wound infection. The presence of any abdominal swellings should be used as a differential diagnosis of umbilical hernia including hematomas, seromas, abscesses, and neoplasia (Fossum, 2013). Our case report describes a surgical and medical treatment of the reponible umbilical hernia in the rabbit.

## CASE PRESENTATION

A 7-months-old intact female, a mixed breed lop-eared rabbit, was presented to the Surgery Clinic of the Veterinary Faculty, University of Sarajevo, with a 4-day history of inappetence and lethargy. The owner also noticed smaller fecal particles. The rabbit was being housed indoors and fed with commercial rabbit food. Written informed consent was obtained from the owner for the procedures undertaken.

A patient was 1.2 kg body weight and had a body score condition 3 of 5 by recommended scoring system. During the clinical examination, all clinical parameters were within the physiological range with no obvious signs of ileus. Reponible, nonpainful, soft abdominal mass at the umbilical scar area was noticed. Bruxism was presented and interpreted as a sign of pain. Right lateral abdominal radiography revealed a mass corresponding to the soft tissue opacity in the umbilical area with unclear content. Gas accumulation in the colon was also presented (Figure 1).

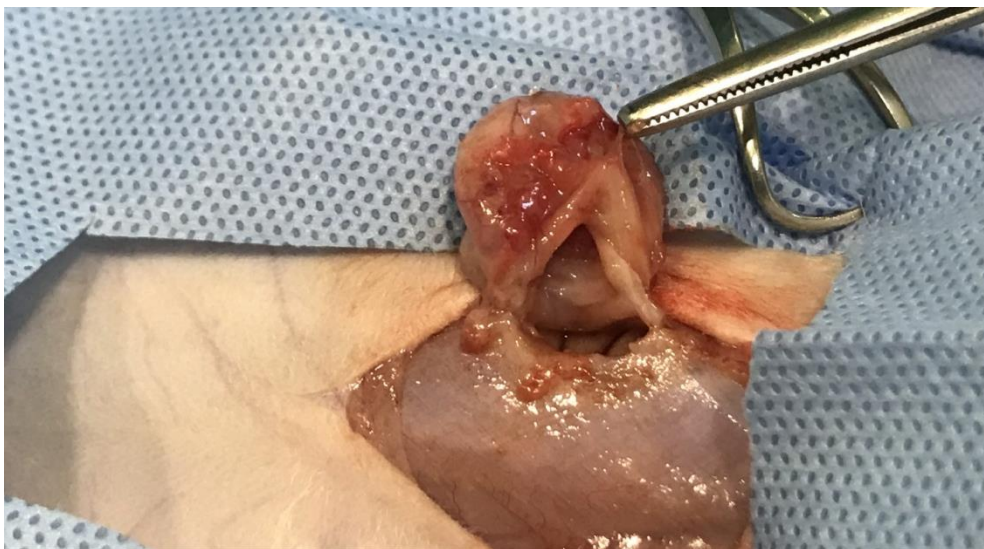
Prior to the surgery rabbit received tramadol (TramadolSTADA, 100mg/2ml, AG, Germany) at a dose of 10 mg/kg, SC, meloxicam (Meloxidolor, 5 mg/ml, Dechra, UK) at a dose of 0.3 mg/kg, SC, and enrofloxacin (Enroxil 50mg/ml, Krka, Slovenia) at a dose of 5 mg/kg, SC diluted in sterile saline. Anesthesia induction was achieved with 5 mg/kg of ketamine (Ketaminol 10, Intervet International BV, Netherland) in combination with 0.1 mg/kg of medetomidine (Sedastart 1mg/ml, Dechra, UK) intramuscularly. A 26G intravenous catheter was placed in a marginal auricular vein (*Vena auricularis caudalis*). The combination mentioned above was sufficient to allow endotracheal intubation and anesthesia maintenance was achieved with isoflurane. After the surgical preparation of the ventral abdomen, the patient was positioned in dorsal recumbency with a slight elevation of the head and thorax. Sterile saline (0.9% NaCl) was used intravenously in a dose of 10 ml/kg/h during the surgery and an electric heater was placed to prevent hypothermia.



**Figure 1 - Right lateral abdominal radiography in the rabbit with umbilical hernia and gas accumulation in the colon**

#### **Surgical and medical treatment**

After the hernia skin incision, the hernial sac 2 cm in size was identified and dissected. The content of the hernia consisted of small intestine segments with no visible tissue changes, which were repositioned into the abdominal cavity (Figure 2). The hernial ring was corrected and freshened before suturing and gentle organ omentalization was performed. The muscle defect was sutured using a simple continuous suture pattern with 3-0 polydioxanone suture material (PDO). The subcutaneous layer and skin were closed with 3-0 polyglycolide acid suture material (PGA) by a simple continuous and intradermal suture pattern. Postoperative treatment consisted of meloxicam (0.2 mg/kg, PO, q24h) for 5 days, enrofloxacin (5 mg/kg, PO, q24h) and commercially available probiotics for the next 7 days. Promptly after anesthesia recovery, the rabbit showed great interest in eating. The owner was advised to monitor the rabbit closely and restrict all excessive activities. Also, fiber-enriched food was recommended. The fecal output was regular and the healing process was clinically evaluated and completed after 14 days. No complications or recurrences were recorded.



**Figure 2 - Peritoneal sac after dissection and repositioning of the small intestine segments**

## DISCUSSION AND CONCLUSION

An incidence of umbilical hernia in rabbits is unknown and congenital hernias are the most common, especially in young calves (Al-Sobayil and Ahmed, 2007, Monsang et al., 2014). Clinical examination of suspected hernia can be difficult to perform in cases where pain, obesity or excessive scar formation is present. It can lead to misinterpretation and diagnostic imaging is very important for accurate diagnosis (Lassandro et al., 2011). In veterinary medicine, small umbilical hernias very often heal spontaneously. Contrary, large or persistent hernias usually require surgical intervention such as counter-irritation, clamping, transfixation sutures, safety pins, rubber bands, and elastrator ring (Al-Sobayil and Ahmed, 2007, Pollicino et al., 2007, Monsang et al., 2014). In human medicine, giant hernias are considered if a defect is larger than 12 cm, but in rabbits it is considered as such if the size is between 2.8 and 3.5 cm. It corresponds to higher mortality, morbidity and recurrence rate and usually applies primarily to abdominal hernias (Yang et al., 2019). Even the size of hernia in our case did not required immediate surgical correction, presence of the symptoms could not be ignored and surgery was proceeded. Because the exact cause of umbilical hernia and its occurrence in rabbits is still unknown, intraoperative assessment and surgical reparation must be performed cautiously. In our case, hernial sac was not adhered to herniated visceral content which simplified procedure significantly. The suturing material and pattern used to correct the hernial ring should be carefully chosen. In rabbits, mattress pattern with black braided silk suture material was previously described (Monsang et al., 2014). The use of the same suture material was also reported on sheep and goats and recommended for animals older than 2 years (Al-Sobayil and Ahmed, 2007). As it's described in previous studies, monofilament sutures are more appropriate so we used PDO in our case for hernial ring correction to prevent complications from encapsulating fibrous connective tissue. Unlike PDO, polyglactin 910 can create tissue reaction for an extensive time period (Temple, 2018). Prior to muscle layer suturing, the omentum was carefully positioned over the viscera, preventing direct contact of the viscera with the incision line. Selection of adequate suturing material and visceral organs omentalization prevent potential gastrointestinal stasis, visceral adhesions, granuloma formation, and promote faster wound healing (Engelsman et al., 2007, Mourad et al., 2021).

Common postsurgical complications are heat loss, anorexia, gastrointestinal stasis, visceral adhesion formation, inadvertent organ penetration, peritonitis, abscessation, wound infection, seroma, and surgical wound dehiscence. These complications can interfere with gut motility and cause discomfort and pain in the rabbit. Therefore, it is imperative to maintain sterility during the surgery, and abdominal organs should be kept moist and handled gently during whole procedure (Szabo et al., 2016).

In the presence of any type of stress or pain in rabbits, gut stasis often occurs. It is very important to monitor potential stasis which is considered as an emergency condition. Postoperative care of rabbits should occur parallel with treatment for gut stasis (Varga, 2015). If untreated, the pain will cause gastrointestinal hypomotility, and gas accumulation will lead to more pronounced pain (Oglesbee and Lord, 2020). Because of the presence of reponible and nonpainful abdominal mass, intestinal incarceration was not suspected. Anyhow, bruxism as a sign of discomfort or pain was probably result of the gas accumulation in colon which can lead to the presented clinical signs, but can be result of the beginning of impairment of the intestinal blood supply as well. In already metabolically unstable animals such are those with gastrointestinal disorders, anesthesia and surgery are high-risk procedures. Aggressive medical treatment is necessary especially in prolonged ileus where hepatic lipidosis is a common complication (Reusch, 2005). To maintain gut motility, adequate feeding and hydration of the animal, as well as analgesia and prokinetics are crucial. Some studies showed that high doses of meloxicam in rabbits are well tolerated (Varga, 2015). Meloxicam as a NSAID is effective mainly against somatic and integumentary pain, but also play a role in reduction of adhesion formation in rats (Temple, 2018). In our case, multimodal approach to analgesia, intraoperative gentle and careful manipulation with internal organs, and appropriate postoperative medical and feeding support resulted in the fast recovery of the patient without gastrointestinal syndrome occurrence. Postoperative meloxicam usage will prevent adhesion formation in rabbits that are certainly predisposed to it. Because fecal output was not significantly impaired, absence of prokinetics in our treatment plan did not impact clinical outcome and adequate pain management was sufficient.

In conclusion, it is essential to provide sufficient analgesia and reduce stress in rabbits, parallel with treating any other condition. Good medical care will significantly improve the outcome and survival rate of the patient so stress-related disorders play a huge role in preventive medicine.

## DECLARATION

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### Authors' contribution

Dr. Ismar Lutvikadić was the veterinarian on patient admission and anesthesia, and was included in treatment plan and manuscript preparation. Dr. Nermina Spahija was included in surgical treatment and manuscript preparation. Dr. Alan Maksimović was included in surgical treatment and manuscript preparation and revision.

## Conflict of interest

The authors declare that they have no conflict of interest with respect to the research, authorship, and/or publications of this article.

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