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SURGICAL CORRECTION OF UMBILICAL HERNIA IN DOMESTIC AND WILD RUMINANTS IN CAPTIVITY: A COMPARATIVE APPROACH

CORREÇÃO CIRÚRGICA DE HÉRNIAS UMBILICAIS EM RUMINANTES DOMÉSTICOS E SILVESTRES EM CATIVEIRO: UMA ABORDAGEM COMPARATIVA

CORRECCIÓN QUIRÚRGICA DE HERNIAS UMBILICALES EN RUMIANTES DOMÉSTICOS Y SALVAJES EN CAUTIVERIO: UN ENFOQUE COMPARATIVO

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ABSTRACT

Umbilical hernia is a common condition in ruminants, particularly in calves and other young animals, characterized by the protrusion of abdominal organs through an opening in the umbilical ring. This article aims to review the surgical procedures used to correct umbilical hernias in domestic and wild ruminants, comparing the most effective treatment strategies. The methodology adopted was a review of the scientific literature, with analysis of articles on diagnosis, conservative and surgical treatment, and postoperative care. The results indicate that while small hernias can be treated conservatively with bandages, larger ones require surgical intervention, with herniorrhaphy using polypropylene mesh being the most effective technique to prevent recurrence. In wild ruminants, such as camels, the approaches are similar, but adapted to the anatomical particularities of these species. The research concludes that the surgical technique,

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combined with early diagnosis and adequate postoperative care, results in good recovery rates in both domestic ruminants and wild ruminants in captivity.

Keywords: Umbilical Hernia. Ruminants. Surgical Correction. Herniorrhaphy. Wild Ruminants.

RESUMO

A hérnia umbilical é uma condição frequente em ruminantes, particularmente em bezerros e outros animais jovens, caracterizada pela protrusão de órgãos abdominais por uma abertura no anel umbilical. Este artigo tem como objetivo revisar os procedimentos cirúrgicos empregados na correção de hérnias umbilicais em ruminantes domésticos e silvestres, comparando as estratégias de tratamento mais eficazes. A metodologia adotada foi uma revisão da literatura científica, com análise de artigos sobre diagnóstico, tratamento conservador e cirúrgico, e cuidados pós-operatórios. Os resultados indicam que, enquanto hérnias pequenas podem ser tratadas de forma conservadora com bandagens, as maiores requerem intervenção cirúrgica, sendo a herniorrafia, com o uso de malha de polipropileno, a técnica mais eficaz para evitar recidivas. Em ruminantes silvestres, como camelos, as abordagens são semelhantes, porém adaptadas às particularidades anatômicas dessas espécies. A pesquisa conclui que a técnica cirúrgica, aliada ao diagnóstico precoce e cuidados pós-operatórios adequados, resulta em boas taxas de recuperação, tanto em ruminantes domésticos quanto em silvestres em cativeiro.

Palavras-chave: Hérnia Umbilical. Ruminantes. Correção Cirúrgica. Herniorrafia. Ruminantes Silvestres.

RESUMEN

La hernia umbilical es una afección común en rumiantes, especialmente en terneros y otros animales jóvenes, que se caracteriza por la protrusión de los órganos abdominales a través de una abertura en el anillo umbilical. Este artículo tiene como objetivo revisar los procedimientos quirúrgicos utilizados para corregir hernias umbilicales en rumiantes domésticos y salvajes, comparando las estrategias de tratamiento más efectivas. La metodología adoptada fue una revisión de la literatura científica, analizando artículos sobre diagnóstico, tratamiento conservador y quirúrgico, y cuidados postoperatorios. Los resultados indican que, si bien las hernias pequeñas pueden tratarse de forma conservadora con vendajes, las más grandes requieren intervención quirúrgica, siendo la herniorrafia con malla de polipropileno la técnica más efectiva para prevenir la recurrencia. En rumiantes salvajes, como los camellos, los enfoques son similares, pero adaptados a las peculiaridades anatómicas de estas especies. La investigación concluye que la técnica quirúrgica, combinada con un diagnóstico precoz y cuidados postoperatorios adecuados, resulta en buenas tasas de recuperación, tanto en rumiantes domésticos como salvajes en cautiverio.

Palabras clave: Hernia Umbilical. Rumiantes. Corrección Quirúrgica. Herniorrafia. Rumiantes Salvajes.

1 INTRODUCTION

Umbilical hernia is a common condition in ruminants, particularly in calves and other young animals, characterized by the protrusion of abdominal organs through an opening in the umbilical ring. This condition can be congenital or acquired, and is commonly seen in crossbred calves, with a higher incidence in females (George *et al.,* 2021). In certain situations, aspects such as improper cutting of the umbilical cord or excessive handling during childbirth can result in inadequate closure of the umbilical ring, which can cause the hernia (Knecht *et al*., 1987).

Diagnosis and intervention in umbilical hernias are essential, since, if neglected, they can lead to serious complications, such as strangulation of internal organs. The severity of the hernia determines the variation in the therapeutic approach. Conservative treatments, such as abdominal bandages, may be effective for smaller, reducible hernias (Rahman *et al*., 2011). However, large or irreparable hernias, which cannot be easily reduced, usually require surgery. Hernia repair, a very common technique, consists of closing the hernial ring, usually with the use of polypropylene mesh to strengthen the abdominal wall and prevent recurrence (George *et al*., 2021; Venugopalan, 2000).

Umbilical hernias are relatively uncommon in wild ruminants, such as camels, although these animals can also be affected. Early diagnosis and surgical intervention are essential to prevent complications, especially in animals in captivity, where constant monitoring is possible (Sadan *et al.,* 2019). Surgery in camels and other wild ruminants follows similar principles to cattle, but must be adapted to the anatomical characteristics of these species (Kaswan *et al*., 2014).

Therefore, the objective of this article is to review the surgical procedures used in the correction of umbilical hernias in ruminants, with a focus on cattle and other wild ruminants, and to compare the most effective treatment strategies based on the most recent scientific evidence.

2 METHODOLOGY

The methodology of this study involved a comprehensive review of the literature on the surgical correction of umbilical hernias in domestic and wild ruminants in captivity. The research was carried out based on a critical analysis of scientific publications, review articles, case studies and relevant clinical reports. The selection of articles covered a wide range of publications, including those published before 2021, ensuring a complete

analysis of the diagnostic and surgical techniques used over time, focusing on the most current studies on the subject.

The research included sources that address the clinical conditions and treatments applied to different types of ruminants, such as cattle, camels and other wild ruminants, taking into account the anatomical and physiological variations between the species. Articles were selected that detail the diagnosis of umbilical hernias through physical examination, ultrasonography and computed tomography, as well as studies that discuss surgical techniques, such as hernia repair, the use of polypropylene mesh and other synthetic materials to reinforce the abdominal wall.

The analysis also considered the comparison between conservative and surgical treatments, noting the indications for each approach and the effectiveness of each depending on the severity of the hernia. The review also included postoperative care, including the use of antibiotics, anti-inflammatories, and post-surgical monitoring, in order to ensure the recovery of the animals and prevent complications.

This methodology provided a holistic view of best practices and most recent advances in umbilical hernia repair in ruminants, with special attention to approaches that can be adapted for wild ruminants in captivity.

3 RESULTS AND DISCUSSIONS

Umbilical hernia is a fairly common condition in ruminants, particularly in calves and other young animals. This condition happens when a part of the abdominal tissue, usually the intestines or omentum, protrudes through an opening in the abdominal wall, as a result of a failure to close the umbilical ring after birth. Umbilical hernia can be congenital or acquired, and in many cases, it is linked to genetic aspects or problems during childbirth, such as trauma or excessive pressure on the umbilical cord (Knecht *et al.,* 1987; Gahlot *et al*., 1994).

3.1 ETIOLOGY OF UMBILICAL HERNIA IN RUMINANTS

Umbilical hernia can be caused by several factors. According to some authors, genetic defects in the formation of the umbilical ring are responsible for the failure to close the opening, leading to hernia. These failures are more frequent in some breeds, such as the Holstein and Jersey, which have a genetic predisposition to the condition (Wheat, 1952). In addition, management conditions and the environment also play a significant

role in the development of hernias. Improper manipulation of the umbilical cord, both by sectioning it too close to the abdominal wall and through inadequate practices during childbirth, can increase the risk of hernia (Kumar and Amresh, 1996). Additional factors, such as umbilical cord infections and increased intra-abdominal pressure due to overexertion during birth, are also known to contribute to the occurrence of umbilical hernias (Brem *et al*., 1985).

3.2 DIAGNOSIS OF UMBILICAL HERNIA

The diagnosis of umbilical hernia is usually simple, based on physical observation of the protrusion located in the umbilical region. In simpler cases, the presence of a hernial sac can be confirmed through clinical examination and reduced manually. Ultrasonography has proven to be an efficient diagnostic tool, particularly to determine the severity of the hernia, the contents of the hernia sac, and any complications, such as adhesions or strangulation (Sadan *et al*., 2019). The use of ultrasound and CT scan images has been essential for surgical planning, providing a detailed view of the structures involved (George *et al*., 2021; Kaswan *et al*., 2014).

3.3 CONSERVATIVE VS. SURGICAL TREATMENT

The approach to treating umbilical hernia in ruminants can be conservative or surgical, depending on the severity and particularities of the hernia. Small, reducible hernias, when identified early, can be treated with abdominal bandages. These devices assist in compressing the contents of the hernia, pushing it back into the abdominal cavity and promoting gradual closure of the umbilical ring. However, in cases of large, irreparable hernias or those with complications such as strangulation, conservative treatment is no longer a viable option, and surgery is essential (Rahman *et al.,* 2011).

Herniorrhaphy, which consists of suturing the edges of the hernial ring, is the most used surgical technique to correct umbilical hernias. The use of polypropylene mesh to reinforce the abdominal wall and decrease the likelihood of recurrence is a common complement to this technique. The use of mesh has shown beneficial effects, as it strengthens the abdominal wall and offers extra support for weakened tissues (George *et al*., 2021; Venugopalan, 2000). Suture techniques also use other synthetic materials, such as silk and nylon; however, polypropylene is the most recommended for its durability and low risk of rejection (Kumar and Amresh, 1996).

3.4 SURGICAL TECHNIQUES

Hernia repair can be performed through several techniques, the most frequent being "lateral imbrication", which consists of overlapping the edges of the hernial ring and fixing the margins with stitches. This technique is widely accepted in cattle and has shown exceptional results. The use of polypropylene mesh to strengthen the suture of the edges of the hernial ring was a successful innovation, as it prevented hernia recurrence and accelerated postoperative recovery (Kaswan *et al*., 2014; Matera *et al*., 1976).

In some cases, the "hernioplasty" approach, which involves the use of a synthetic mesh to reinforce the abdominal wall, is used when the hernia ring is too large or the abdominal muscles are excessively weakened. This type of intervention has shown a very high success rate, with a complete and uncomplicated recovery for most operated animals (Sadan *et al*., 2019).

3.5 UMBILICAL HERNIA IN WILD RUMINANTS

Umbilical hernia is a more common condition in domestic ruminants, such as cattle, but it can also occur in wild species kept in captivity, such as camels and antelopes. Umbilical hernia is uncommon in camels, but when it happens, the diagnosis and treatment are similar to those applied to cattle. However, surgical techniques need to be adjusted to meet the particular demands of each species, due to the anatomical and physiological variations of wild ruminants. The use of polypropylene mesh, as in cattle, has proven to be a viable option to strengthen the abdominal wall, especially in situations of large or complicated hernias (Sadan *et al.,* 2019; Kaswan *et al.,* 2014).

3.6 PROGNOSIS AND POSTOPERATIVE OUTCOMES

The prognosis for ruminants surgically treated for umbilical hernias is generally good, with most animals making a complete recovery and no complications. Animals operated with hernia repair and the use of polypropylene mesh generally have a rapid healing and without recurrence (Venugopalan, 2000). However, as with any surgical procedure, there is a risk of complications such as infections or anesthesia-related problems. Postoperative monitoring is essential to ensure complete recovery and prevent complications.

4 FINAL CONSIDERATIONS

Surgical correction of umbilical hernias in ruminants, especially in cattle and other wild ruminants, is a well-established procedure that has shown good results when performed properly. Hernia repair, complemented with the use of polypropylene mesh, has been shown to be the most effective approach, reducing the risk of recurrence and providing a quick recovery for the animals. The use of imaging techniques, such as ultrasonography and computed tomography, has proven to be essential for accurate diagnosis and surgical planning, especially in complicated cases. Adapting these techniques to wild ruminants in captivity is a challenge, but preliminary results indicate that the approaches used in cattle can also be effective in non-domestic species, and further research is needed in the area.

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