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Innovations in minimally invasive techniques in animal surgery

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ABSTRACT

Objective: To analyze the main innovations in minimally invasive techniques in animal surgeries. In the field of Veterinary Medicine, CMI is becoming increasingly popular, being seen as an alternative to traditional surgical techniques. Procedures such as laparoscopy, endoscopy, laser therapy, and 3D robotics are revolutionizing the field, bringing benefits such as less pain, lower risk of infections, and faster recovery of patients. Given the growth in demand from animal caregivers and the advancement of technology, it is expected that these techniques will continue to improve and become more accessible. Laparoscopy allows for less invasive diagnoses in internal cavities, while endoscopy allows abdominal surgeries with smaller incisions. The healing of injuries and wounds is accelerated by laser therapy, which facilitates pain relief and functional recovery. At the same time, 3D robotics offers precision in the production of customized prostheses and surgical guides, contributing to better surgical outcomes. Final thoughts: Despite initial barriers such as high costs and the learning curve, CMI is constantly expanding, improving standards of veterinary care. With the advancement of technologies and the increased demand for less invasive techniques, these innovations

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are expected to continue to grow and become more accessible, raising the quality of animal care

Keywords: Innovations, Animals, Surgeries, Techniques.

INTRODUCTION

Minimally Invasive Surgery (MIC) has been used more frequently since it was introduced in Veterinary Medicine. It is an emerging area in Veterinary Medicine, similar to what happens in Human Medicine, although its growth demonstrates a significant advance in Human Medicine. On the other hand, it has become an area of interest in veterinary surgery, with a tendency to replace certain traditional surgical procedures (ARAÚJO, 2022)

Human medicine was a pioneer in the development and discovery of MICS. The emergence of endoscopy and the need for new diagnostic methods that focus on exploring the cavities and orifices of the human body (RAWLINGS, 2015). The number of deaths related to endoscopic procedures increased initially and the result of the lack of confidence of health professionals as well, which made it difficult to implement it in clinical practice. Important variables, such as the early initiation of techniques and insufficient instrumentation to ensure the adoption of the minimally invasive strategy, hindered the process of introduction into clinical practice. However, it was recognized that the failure contributed to the preparation and training of the surgeon (RAWLINGS, 2015; ARAÚJO, 2022).

Minimally invasive surgery requires certain skills that are not acquired in traditional surgical practice. Additionally, obstacles to its expansion into the field of veterinary medicine include the high cost of necessary materials, the lack of suitable training simulators, and the need to develop specialized skills. However, the standards of veterinary medical care are increasing due to new techniques, the growing demand from owners for less invasive procedures, and technological advances (JONES et al., 2017; OVIETO-PENÃTA et al., 2020)

LITERATURE REVIEW

In veterinary medicine, particularly in the treatment of small animals, minimally invasive surgery (MIC) techniques are gradually replacing many conventional procedures. This change is a sign of a growing trend towards the use of these

techniques. In addition, the number of publications that focus on this area, especially those that refer to laparoscopy, has increased significantly. There is evidence that CMI benefits both surgeons and patients, offering several advantages compared to traditional surgery. However, the high costs of the instruments and the long learning curve required for their implementation are some of the limitations of this approach (McCarthy, 2021)

Veterinary Medicine students should start working with minimal intrusion practices early on to reduce learning problems. Animal owners have increasingly sought this type of intervention because they believe that MIC is a less invasive option. Clinicians are looking for new techniques to improve veterinary care, which has led Veterinary Medical Care Centers (CAMV) to incorporate CMI into their daily routine. (MCCARTHY, 2021; LEVI, 2016).

In this context, four innovative techniques have revolutionized veterinary medicine: laparoscopy, endoscopy, laser therapy and 3D robotics. Laparoscopy and endoscopy offer minimally invasive approaches to diagnoses and surgical interventions, allowing for faster recovery and fewer complications for patients. Laser therapy, in turn, has stood out in the treatment of various conditions, promoting healing and relieving pain effectively. Finally, 3D robotics represents a new frontier in surgical precision, providing veterinarians with advanced tools to perform complex procedures with greater safety and effectiveness. Each of these techniques brings significant contributions to veterinary practice, raising the standards of care and the quality of life of the animals cared for (LEVI, 2016).

LAPAROSCOPIA

Laparoscopy is a minimally invasive surgical technique that involves using a rigid endoscope to access and explore the abdominal organs. This method is characterized by the use of small incisions in the abdominal cavity, through which specific equipment is inserted to perform various procedures. Among its main advantages are reduced postoperative pain, lower risk of infection, reduced hospitalization, and faster recovery compared to conventional surgery. Studies show that reduced tissue trauma and lower exposure of the viscera in laparoscopy contribute to lower levels of intraoperative stress (ARAÚJO, 2022).

In addition, the increased view of the organs during the procedure provides greater diagnostic and therapeutic accuracy, enabling safer and more effective biopsies. However, laparoscopy requires specific surgical skills and a prolonged learning period, as visual and motor coordination is challenged by the lack of direct contact with tissues and by the two-dimensional examination of structures. Among the main contraindications are patients with clinical instability, absence of adequate conditions in the surgical environment, such as appropriate equipment or surgeon experience, in addition to factors such as severe obesity, septic peritonitis, portal hypertension, and disseminated malignant tumors (ARAÚJO, 2022).

ENDOSCOPIA

Endoscopy is a minimally invasive technique that uses an endoscope, an instrument equipped with a camera, to view and access internal cavities of animals, such as the digestive, respiratory, and urinary tracts. This procedure can be performed for both diagnosis and surgical interventions, being a less traumatic alternative to conventional surgeries. Among the advantages, less postoperative pain, reduced recovery time and lower risks of infection stand out (CRISTINA, 2012).

The technique known as transluminal endoscopy through natural orifices (NOTES) represents an advance, as it allows access to the abdominal cavity through natural openings, such as the mouth or anus, eliminating the need for external incisions. This strategy decreases the likelihood of hernias and healing problems, as well as offering superior aesthetic results. Another innovation is single-portal laparoendoscopic surgery (LESS), in which all tools are introduced through a single small incision, usually in the navel, which further reduces surgical trauma. These techniques are increasingly being applied in veterinary medicine, especially in procedures such as ovariohysterectomy (OSH) and biopsies, offering considerable benefits for the recovery of patients (BARON, 2007).

LASER THERAPY

Laser therapy is a therapeutic method used in veterinary medicine for the recovery of animals, which is based on the emission of light amplified by stimulated radiation (LASER), which acts on the tissues to provide several advantages. Laser light reaches tissues and is picked up by cellular chromophores, boosting ATP production

and cellular metabolism. This accelerates healing, decreases pain and inflammation, and enhances injury recovery (GALLEGUILLOS, 2022)

Laser therapy has as its main benefits the healing of wounds (stimulation of fibroblasts and collagen production), the recovery of bones and cartilage, the control of osteoarthritis (reduction of inflammation and pain), in addition to the recovery of ligament and tendon injuries (Physiotherapy-149). In addition, the treatment offers pain relief, favors the regeneration of peripheral nerves, and favors functional recovery in situations of neurological injuries. Dosimetry (amount of energy applied) is a fundamental element, which changes according to the nature and severity of the condition being treated, and can be adjusted according to the size and particularities of the patient (GALLEGUILLOS, 2022).

ROBÓTICA 3D

3D robotics, also known as 3D printing, is a rising technology in the field of veterinary medicine, particularly in surgical procedures. Additive manufacturing, also called 3D printing, involves creating three-dimensional physical models from digital information. It provides a great advantage for surgery planning, production of customized prostheses, and veterinary education (SAMPAIO, 2022).

In veterinary medicine, 3D printing makes it possible to create biometric models, surgical guidelines and personalized prostheses for each patient. This allows for greater accuracy in surgeries, reduced failures, and shorter recovery times. Research has indicated that printed surgical guides have the ability to equalize outcomes between experienced and novice surgeons, aiding in the safety of operations. In addition, pulmonary prostheses produced through 3D printing have shown positive results in reducing complications after surgery (ARAÚJO, 2022).

This technology is also beneficial in learning anatomy and surgical techniques. 3D printed models of bones and organs enable students and professionals to make a clearer analysis of complex cases, which is essential for improving learning and clinical practice. 3D printing is a revolutionary resource that is revolutionizing veterinary medicine, enabling broader customization and greater safety during surgical procedures (SAMPAIO, 2022).

FINAL CONSIDERATIONS

The implementation of minimally invasive surgery (MIS) in veterinary medicine signals a trend of steady progress, bringing remarkable improvements in the quality of care offered to pets. However, there are still obstacles to be overcome, such as the high price of equipment and the delay in learning for surgeons. Given the growth in demand from animal caregivers and the advancement of technology, it is expected that these techniques will continue to improve and become more accessible. Laser therapy and 3D printing illustrate the possibilities that technology provides in clinical veterinary practice, standing out as valuable instruments to improve surgical outcomes and accelerate patient recovery. The application of these innovations, along with specialized training, has the potential to raise quality standards.

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