

A review current trends in orthopedic surgery for companion animals

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Abstract- Orthopedic surgery in companion animals has experienced remarkable advancements, closely mirroring innovations in human medicine. With the increasing prevalence of musculoskeletal disorders such as cranial cruciate ligament rupture, hip dysplasia, and complex fractures in pets, veterinary orthopedic interventions are evolving to meet clinical demands. This review explores current trends shaping the field, including minimally invasive surgical techniques, the widespread adoption of Tibial Plateau Leveling Osteotomy (TPLO), and the integration of advanced technologies such as 3D printing for custom implants. The role of regenerative medicine—utilizing platelet-rich plasma, stem cells, and other biologics—is also examined for its potential in enhancing healing and managing degenerative joint diseases. Additionally, we highlight the importance of postoperative rehabilitation strategies, including hydrotherapy and structured physical therapy, in improving recovery outcomes. These developments collectively represent a shift toward more precise, patient-specific, and holistic orthopedic care in veterinary practice, ultimately contributing to improved mobility and quality of life for companion animals.

INTRODUCTION

Orthopedic surgical procedure in associate animals has visible good sized advancements in current years, paralleling improvements in human remedy. as puppy possession keeps to rise, so does the call for powerful surgical interventions to deal with musculoskeletal problems in dogs, cats, and other small animals. conditions such as cranial cruciate ligament tears, hip dysplasia, and fractures are more and more handled with state-of-the-art strategies that beautify recuperation and improve pleasant of life (1,8). this review objectives to explore the current developments in orthopedic surgery for companion animals, specializing in minimally invasive strategies, using superior imaging modalities, and biomaterials that contribute to a success surgical consequences. we may even speak the combination of rehabilitation practices and postoperative care, which are important for ensuring superior restoration. by inspecting those trends, we hope to provide a complete

evaluation of how veterinary orthopedic surgical treatment is evolving to fulfill the desires of our furry companions

II-MINIMALLY INVASIVE SURGICAL TECHNIQUES

Traditional orthopedic surgeries regularly required big incisions and extensive dissection. Today, minimally invasive orthopedic surgical procedure (MIOS) has grow to be increasingly commonplace, mainly in joint methods like arthroscopy. Arthroscopy, once confined to area of expertise practices, is now a mainstream technique used for prognosis and remedy of joint sicknesses like elbow dysplasia, OCD (osteochondritis dissecans), and meniscal accidents. The fluoroscopy-guided fracture fixation lets in for specific alignment with smaller incisions and quicker recovery. The advantages of this techniques are reduced surgical trauma, lower infection risk, shorter anesthesia times and faster rehabilitation Minimally invasive surgical techniques are transforming the landscape of veterinary orthopedics. By reducing tissue trauma, accelerating recovery, and improving precision, these approaches offer clear benefits to patients, pet owners, and surgeons. As the technology and training become more accessible, MIOS will likely become standard practice in treating many orthopedic conditions in companion animals. (2,9).

III-TIBIAL PLATEAU LEVELING OSTEOTOMY (TPLO) AND CRANIAL CRUCIATE LIGAMENT REPAIR

Cruciate ligament rupture is the most common orthopedic issue in dogs. The TPLO has become the gold standard for medium to large breeds. Unlike traditional extracapsular repair, TPLO stabilizes the stifle joint by changing the biomechanics of the tibial plateau. Tibial Tuberosity Advancement (TTA) is another dynamic alternative for specific cases. The key benefits are long-term joint stabilization, higher success in active and large-breed dogs and lower risk of long-term arthritis. TPLO has become the gold standard for surgical repair of CCL rupture in large and active dogs due to its strong biomechanical rationale and consistently high success rate. While TTA and extracapsular techniques have their place, TPLO remains the most commonly performed procedure in orthopedic veterinary practices today. Advances in implant design, imaging, and

surgical technique continue to refine TPLO outcomes and reduce complication rates, making it a powerful tool for restoring mobility in canine patients. (3,10)

IV-CUSTOM IMPLANTS AND 3D PRINTING

The use of 3D-printed orthopedic implants is growing rapidly in complex fracture repair and tumor resection. Custom plates and joint replacements can be tailored to each animal's anatomy using CT imaging and CAD software. Printed prostheses are actually being used in limb-sparing surgical procedures for bone tumors, offering options to amputation. Custom implants and three-D printing are transforming orthopedic surgery in partner animals through allowing specific, patient-precise answers for complex surgical challenges. With advantages in accuracy, surgical efficiency, and consequences, these technology are becoming fundamental to superior veterinary exercise. As charges lower and accessibility improves, three-D printing is poised to come to be a trendy tool in the veterinary orthopedic health practitioner's arsenal (4,11).

V-REGENERATIVE MEDICINE AND BIOLOGICS

Platelet-Rich Plasma (PRP), mesenchymal stem cells (MSCs), and autologous conditioned serum (ACS) are increasingly utilized in veterinary orthopedics to sell recuperation and manage osteoarthritis.

PRP: Concentrated increase factors from the affected person's personal blood used to enhance tendon and ligament recovery. Stem cells: Harvested from bone marrow or adipose tissue; used for cartilage regeneration and continual joint disease. These treatment plans are regularly used at the side of surgery or as standalone treatments for early-level situations (5).

VI-ADVANCES IN POSTOPERATIVE REHABILITATION

Rehabilitation and ache management are critical additives of contemporary orthopedic care. Techniques include:

- 1-Hydrotherapy and underwater treadmills
- 2-Laser therapy and TENS (electric stimulation)
- 3-Structured bodily remedy plan

These interventions help repair energy, variety of motion, and prevent complications inclusive of muscle atrophy (6).

VII-TOTAL JOINT REPLACEMENT

Total hip substitute (THR) in dogs is now not a final hotel. Newer systems with modular, cementless implants reduce complications and are being adapted for elbows and stifles. High success rates in dysplastic and arthritic patients, improved gait and pain relief and growing use in younger dogs for long-term joint function (7,12).

CONCLUSION

Orthopedic surgery in companion animals is progressing at a remarkable pace. Minimally invasive techniques, biologic therapies, custom implants, and comprehensive rehab protocols are redefining standards of care. As these technologies become more accessible, outcomes for pets continue to improve. It is crucial for veterinarians, students, and even pet owners to stay

informed about these developments, ensuring the best possible quality of life for companion animals.

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