

RABBIT (*Oryctolagus Cuniculus*) AS A MODEL FOR ANIMAL SURGICAL PROCEDURE OSTEOSYNTHESIS

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ABSTRACT

The osteosynthesis is a surgical procedure that allows stabilizing bone fragments by metal implants in contact with bone (internal fixation), such as plaques, nails, screws, wire, among others. This surgical procedure not only consider reducing and fixing the fracture, one must also take into account variables and biomedical importance of soft tissue, that is bone not those relating to the skeleton. The main was to evaluate the rabbit as an animal model surgical procedure osteosynthesis of the tibia and fibula, with reference to the findings reported in human and veterinary medicine in order to properly address the fractures caused by trauma. Material and methods: a lagomorph (*Oryctolagus cuniculus*) male 9 months with a history of falls from 1 meter high and grade IV claudication came to Small Animal Veterinary Hospital of the University of the State of Mexico, fracture was confirmed by radiography, was performed surgery where intramedullary nails placed tied in with an external fixator configuration type 1 candle 1-2 and acrylic rod, the post-surgical advances were recorded for 4 months. Results: With previous work, it has managed to establish osteosynthesis as a surgical procedure for reduction and fixation of the fracture, therefore it is necessary to take this research in an animal model such as the rabbit meets physiological characteristics similar to the human, may be considered not only the fixation of the fracture, also Medical variables and physiology of the soft tissues, as well as less invasive techniques. Conclusion: The similarities between animal models and humans are not limited to the bone structure in its basic mechanical properties if not in many cases gross

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anatomy has many parallels. The rabbit is an excellent animal model for studies that help evaluate techniques and implants in fractures caused by high energy trauma in the tibial region, as in the field of medical surgical procedures that can reach complicated microsurgical techniques are required.

Key words: Osteosynthesis, Fractures, Rabbit, Microsurgical Techniques.



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INTRODUCTION

In recent years, the rabbit has great popularity as a pet. Such that, they run the risk of accidents from falls, crushing furniture, vehicles and even damage being bitten by dogs or cats. Which may cause injury endless and in the worst fractures occur. Since the early 90s and until now, has been considered a fracture is the loss of normal continuity of bone or cartilage substance whose result is derived from a blow, or pulling force whose intensity exceeds the elasticity of the bone (Murray , 1996; Currey, 2002). Most unstable tibial fractures, that is, the oblique, spiral and comminuted fractures, have poor rotation of the distal fragment relative to the proximal at the time that the initial injury occurs (Tie Chen et al., 2012). Such fractures tend to move at a greater than 45 ° oblique stroke and obviously requires the use of an external fixator for remodeling.

Osteosynthesis is the surgical procedure that stabilize bone fragments by metal implants in direct contact with the bone, which is called internal fixation respecting biological and biomechanical rules (Ching-Jen et al., 2010). A fastening technique that stabilize fractures from outside the body are called osteotaxis and is performed by an external fixator. External fixators are intended, stabilize the bone to repair and allows natural movement the animal (Owen, 2000). The surgeon should try to reproduce the shape of the broken limb when not treat the fractured limb, this implies not only wrong but also the rotation angle. He must choose whether the general or local trauma is to infer the risk of shock, pain may be triggering this process so should be prevented and controlled. The objective of this research was to perform the implementation of surgical treatment, osteosynthesis of tibia and fibula in the left hind limb in a rabbit.

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MATERIALES Y MÉTODOS

It was presented to the Small Animal Veterinary Hospital of the University of the State of Mexico, a lagomorph (*Oryctolagus cuniculus*) male 9 months with history of fall from 1 meter high and lameness grade IV.

A clinical evaluation physiologic parameters were within the reference ranges, with 3.2 kg of body weight, the orthopedic examination increased volume static soft tissue at the level of distal



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third tibia through the left hind limb was observed in the cranial face of the tibia in the same member the presence of a hematoma was observed. On palpation this a loss of bone continuity was perceived at the level of the distal third of shaft with medial displacement of a bone fragment.

Raphic studies where fracture was observed in the distal metaphysis of the tibia and fibula with presence of two laterally displaced free chips was performed.

SURGICAL PROCEDURE

After radiographic study, owners proposed performing the surgery because the fracture. Considering the type of operation, it was decided to anesthetize the animal. The overall health of the rabbit was assessed before the anesthetic or surgical event. Clinicians ensured that had no clinical signs of respiratory disease (sneezing, lacrimation or nose) in addition to the absence of diarrhea, since patients with these abnormalities should not be considered candidates for surgical procedures. During surgery, an intramedullary nail tied in with an external fixator configuration type 1 candle 1-2 and acrylic rod was placed.

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POSTOPERATIVE MANAGEMENT

It was decided to send the patient home because it showed stress immediately after anesthetic recovery. Enrofloxacin was prescribed a 5 mg / kg / PO / BID for 10 days and Meloxicam 0.3 mg / kg PO SID for 3 days.

RESULTS

Postoperative follow-up

First review

Seven days after surgery, the patient was brought to review. The owners commented that the rabbit ate less and had decreased water consumption, defecated and urinated normally. They said that a day before the review had jumped from a height of 10 cm and after that I do not support the



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operated limb as he had done before. We proceeded to the physical and orthopedic examination. Lameness grade III, manipulation extension angle decreased level tarso-tibial joint was identified. In distal tibia midshaft volume increase of palpable bone tissue. When inspecting the surgical wound erythema and was attached by 3 points with simple suture separate devitalization of tissue in the central portion. Washing the wound and inserts nails external fixator applied aloe (aloe vera) in the surgical wound was performed. Was administered via SC meloxicam 0.2 mg / kg and was sent home with enrofloxacin 5 mg / kg PO BID.

Second review

17 days after surgery, anamnesis was performed identifying that the patient had diarrhea after eating certain foods (toast, bread, chocolate and biscuits). Clinical examination identified during exploration of Left member and the femorotibial region slight erythema in the presence of an eroded in the proximal part of the tibia on the inside area. The surgical wound was characterized by a process of healing with increased volume of tissue adjacent to the hematoma decreased. Wound cleansing and pin insertion of the external fixator was performed, all coupled with the application of aloe.

Meloxicam administration was suspended and sent home with enrofloxacin at 5 mg / kg PO BID for 5 days, cleaning the wound, the external fixator once a day and you put an Elizabethan collar to prevent licking the rabbit underwent surgery area.

Third review

30 days after surgery, the results indicate no history of diarrhea and absence placement Elizabethan collar was take out. At physical examination, light skin lesions are observed. Static orthopedic examination, enlargement of bone level distal palpable, dynamically presents lameness grade III and slight decrease in the extent of tarsotibial joint. It refers to relative rest house, usual diet and 0.05% chlorhexidine SID.

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Fourth review

At 47 days post surgery, the owner says the patient supports over the operated extremity orthopedic examination shows lameness grade II, muscle atrophy and increased bone level distal third of tibia. Study radiograph is performed and refers home with cleaning the wound and insertion points of nails.

fifth review

In 56 days this review was conducted, the clinical examination, the patient was observed scratching ears and scabs were found in these. On inspection of ear canals hyperemia active scabs and itching was observed. In left hind limb was confirmed that the external fixator was clean and functional. In the medial surgical scar. At orthopedic examination grade 1 left hind limb claudication, although the patient continued decrease in muscle mass.

The patient is sent home with 0.5 ml of benzoyl peroxide in each ear once a week until the next revision, it was recommended to continue cleaning the pin insertion. Radiograph in which the fracture line and minimal tissue formation was observed bone repair was performed.

Sixth review

At 61 days, the patient no presented itching ears but a small crust was observed circular 1 mm in diameter at the entrance of the ear canal of the right ear. In left member in the proximal nail hyperemia was observed in medial level without secretions and the external fixator is kept clean and functional. Hair growth was observed in surgical site, general decrease in muscle tissue throughout the member. The patient was sent home with clean nails at its insertion into skin and benzoyl peroxide in each ear.

Seventh review

At 63 days, it was observed that the external fixator was functional and clean, it refers to the area of sedation and anesthesia for removal of implants, enrofloxacin was administered 8 mg / kg / sc



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single dose. Radiographic control study where persistence of the fracture line was performed appreciated and scar tissue.

Eighth revision

At 129 days, the review of which patient was clinically healthy was performed radiograph was observed callus formation and stability of the fracture. The patient was discharged.

DISCUSSION

In this clinical case, the surgeon identified a number of factors that allowed him to know what type of injury he was facing and based on that, determine orthopedic surgical technique that was recommended in these cases. Tasuyama et al. (2000) reported that in cases of compound fracture, the veterinary surgeon must carefully consider the type of injury you face, considering clinical, biological and mechanical individual patient factors.

The basic principles for the treatment of fractures in small size mammals are similar to those established in mammals large size for both rigid stabilization and anatomic alignment with minimal disruption in the formation of callus tissue dissection and included soft (Tista, 1993, Friedenberget al., 2011). Whatever mentioned in literature, working with rabbits patients, the orthopedic surgeon is faced with the problems inherent in working with rabbit bones, highlighting the small size and fragility. Although this difficulty, we must find a way to keep the forces exerted on the fracture. Here, Avery (2013) reported that the compression, rotation and bending forces are exerted on the fracture and be neutralized to promote fracture healing.

A study by Fornells et al. (2005) showed clearly that the fibula does not have enough to stabilize a proximal tibia fracture rabbit capacity. Therefore, although a fractured tibia which is not accompanied by a broken fibula can not be stabilized without the help of an external fixator to occur. Any fixative used should be well tolerated by the patient and in turn, should enable them to develop the extent possible, the natural behavior of the species. The main factors for bone



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remodeling are the periosteum and neurovascular factors (Hiertonn, 1956; Ring, 1957; Kellerova et al, 1970;. Weber, 1977; Houghton and Dekel, 1979; Pauwels, 1980, Auer and Martens, 1982; Eckardt et al. 2003).

Ching-Jen et al. (2010) mentioned that the angle in the fracture affects the orientation of the joint surfaces and the alignment of all the member and therefore does not cause deformity only in the bone but also in the rest of the limb.

The misalignment of the surfaces of the joint will have a much stronger effect on the mechanics of the misalignment extremity in the fracture (Bottinelli et al. 1996).

Furthermore, the owner cooperation is very important for patient controlling. It is preferable to hospitalize the animal that is not going to be controlled (Hulse and Johnson, 1999). It is considered that the success of this case was related to proper cooperation of the owner, the appropriate surgical procedure and postoperative management.

During the postoperative period, the rabbit remained content in their habitat and relative rest given the severity of your fracture, it was suggested to stimulate the rabbit will support slightly weight (not too much) on the operated to accelerate ossification member. Chidgy, 1986 and Uri et al. 2008, indicate that the severity of the fracture makes it necessary to take a number of precautions postoperatively. Ruiz (2001) indicated the importance of the animal bear weight as soon as possible to stimulate the creation of fracture callus, suggesting that it is a controlled movement without much weight bearing, which can not be done if the patient is loose or without control. With these considerations, the veterinary surgeon should be able to choose the containment system used.

Orthopedic surgery currently has among its main challenges the treatment of complicated fractures. The use and combination of various surgical and fixing methods different techniques are, in most cases, the only way to carry out an effective treatment.

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The results obtained with this type of case in the Small Animal Hospital of the University of the State of Mexico have had a high success rate. However, we can not standardize these treatments since variability and mechanical requirements make it impractical fractures. The results in the treatment of these fractures are significantly improved thanks to the emergence of new materials. This, coupled with the gradual trend towards specialization of the clinician, is reflected in a greater number of treatment options and a marked improvement in the prognosis of these diseases.

CONCLUSION

Surgical treatment combined with the medical treatment the patient's condition improved, avoiding the loss of function of the left member. This includes an integrated management, taking into account the needs and abilities of the patient, physical therapy is a complementary part and is one of the most important resources that are generally not given the importance it deserves, both in orthopedic diseases, such as joint, neurological and muscle.

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