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The Therapeutic Potential of Amniotic Membranes in Canine Femoral Iatrogenic Fracture Repair

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ABSTRACT: This study was to assess the therapeutic effects of amniotic membranes (AMs) in improving the healing of iatrogenic femoral bone defects in a canine experimental model. Ten male dogs were osteotomized to produce a standardized bone defect in the mid-shaft of the femur and randomly divided into a control group and an AM-treated group (n=5 dogs/group). Clinical and radiographic evaluation of bone healing was done on day 7 and 14 after surgery. The clinical observations showed a faster and full recovery in AM-treated group which had significantly less knuckling and evidence of discomfort than the control group. Radiographic observation on 7 days after surgery revealed that the bone defect was still evident with a dark radiolucency in the control group but in AM-treated group, there was already evidence of endosteal reaction around the defect. After 14 days, AM-treated group had shown vigorous callus differentiation resulting in a substantial reduction and almost complete disappearance of the defect, accompanied by a significant enhancement of callus density. Although the control group too exhibited the formation of the callus by the end of day 14 the defect was still visible slightly, which means that the healing path is slower. Together, they indicate that the use of the amniotic membrane is an effective method of accelerating and improving the quality of the bone repair in surgically-induced bone fractures of the femur and supports its promising ability as a treatment of canine orthopedic traumas.

INTRODUCTION

Long-bone fractures, and especially in the femur, are a threatening clinical complication in both human and veterinary orthopedic medicine, and commonly cause protracted recovery and disabling complications such as non-union, malunion, and chronic lameness (Żylińska *et al.*, 2021; Jassim *et al.*, 2023). Although contemporary surgical reduction and internal fixation have developed to a high level, biological bone repair is not optimal in the situations of large comminution or iatrogenic trauma (Hasenboehler *et al.*, 2011; Mavrogenis *et al.*, 2016). The case of iatrogenic fractures, namely fracture which occurs during surgical procedures such as screw or intramedullary nail drilling, is a special complication in which mechanical stress or thermal necrosis might weaken the integrity of bone (Chan *et al.*, 2025). Such fractures tend to happen in a surgically and biologically hostile environment, which requires new therapeutic approaches to improve and speed up the bone formation process to a higher level compared to the current state of the art practice. Herein the area of regenerative medicine provides a potential remedy in the form of amniotic membranes (AMs) which are ethically uncontroversial biological substances that