

MODULATION OF NITRIC OXIDE PRODUCTION BY THERAPEUTIC PULSED ULTRASOUND IN A CANINE TIBIA FRACTURE MODEL

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Abstract. The purpose of the present experiment was to monitor the effect of therapeutic ultrasound application on the time course of blood nitric oxide concentrations in an experimental fracture model in dogs. In 24 male mixed-breed adult dogs, transperiosteal osteotomies of right tibia and fibula were performed. After being operated, dogs were allotted to 4 groups: in Group 1 (IMO control; n=6) the osteotomies were fixed with a Kuntscher nail (intramedullar osteosynthesis; IMO). In Group 2 (PLO control; n=6), the osteotomies were fixed with a plate and 6 cortical screws. In dogs from Group 3 (IMO+U; n=6), fractures were fixed with Kuntscher nails and a low-intensity ultrasound therapy was applied at the fracture site. Osteotomies of dogs from Group 4 (PLO+U; n=6) were fixed by plate osteosynthesis and submitted to ultrasound therapy. Blood serum nitric oxide concentrations were assayed prior to the surgery, by post operative weeks 1, 2 and post operative months 1, 2 and 3. In control groups (IMO and PLO), serum NO increased statistically significantly as early as the first week and persisted high until the end of the second week. In the groups treated with ultrasound, the increase was significant by the end of the second post-operative week for both osteosynthesis techniques used. For the PLO+U group only, they remained higher vs preoperative values until the end of the second month. Serum NO concentrations differed considerably between ultrasound-treated and control groups by the first post-operative week ($p<0.01$ in both methods of osteosynthesis) and by the end of the 2nd and the 3rd months ($p<0.01$ for PLO groups). In the early fracture healing stage, NO levels were higher in control groups, whereas in late stages – in ultrasound-treated groups. In conclusion, despite the osteosynthesis technique used, the application of therapeutic ultrasound reduced the production of nitric oxide during the early inflammation stage of fracture healing but stimulated its formation at later stages of callus formation. It could therefore be successfully utilized as a physical therapeutic adjunct to operative treatment of such traumas in a clinical setting.

Keywords: dogs, osteosynthesis, therapeutic ultrasound, nitric oxide.