

DELAYED UNION FEMUR FRACTURE TREATED WITH LASER THERAPY TO STIMULATE BONE HEALING

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We often think of wound healing cases that would benefit from the application of laser therapy, or perhaps challenging osteoarthritis cases that could use another modality for pain relief. However, many clinicians may not have immediately considered the application of laser therapy (photobiomodulation therapy, or PBMT) for assisting not only in pain relief for veterinary patients with fractures, but also in stimulation of bone healing. Whether the fracture has recently been surgically fixated or is showing signs of delayed union or non-union, PBMT may be used as part of comprehensive fracture management. In addition to the many ways that PBMT relieves pain, there is evidence in the literature for its use in stimulating bone healing.

In a recent review of 25 relevant articles looking at the application of PBMT in bone healing (13 *in vitro* and 12 animal studies), 11 *in vitro* studies showed positive results with regard to acceleration of cell proliferation and differentiation and all animal studies showed improved bone healing at laser-treated sites.¹ While some studies have shown that PBMT's effects were more prominent when treatment started during the acute phase of the injury, most also demonstrated that laser therapy still aided the bone consolidation process and favored the

mechanisms involved in bone repair when used in the chronic phase. This is true not just for normal patients, but also for osteopenic patients, as well as those with compromised healing, with documented improvement in the osseointegration process and/or a higher amount of newly formed bone in laser-treated groups compared with control animals in studies.

Further controlled studies in veterinary patients should be performed to characterize the effects and optimal dosing for treating fractures; however, at this time, many practitioners utilizing laser therapy in clinical practice on a daily basis are reporting success. The results and photos from one such case are shared below.

HISTORY

A 1-year-old, spayed female mixed-breed dog was surrendered to the humane society with an unknown

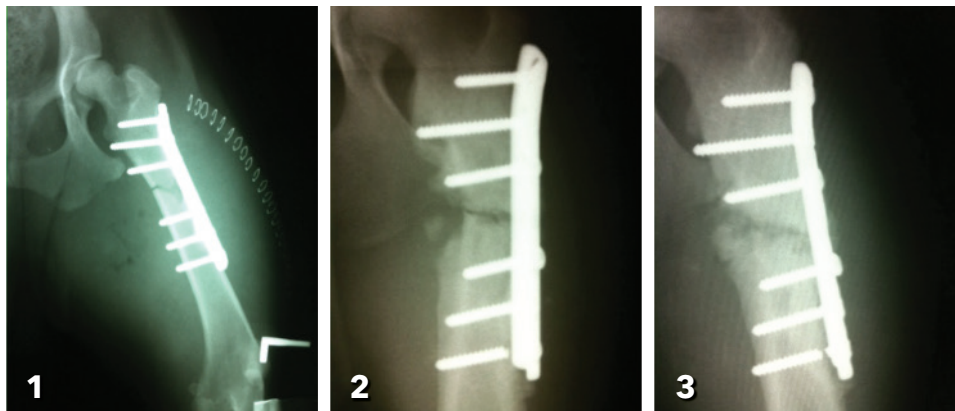


FIGURE 1. Radiograph of fracture obtained immediately after surgery.
FIGURE 2. Radiograph of fracture obtained 8 weeks postoperatively.
FIGURE 3. Radiograph of fracture obtained 12 weeks postoperatively. Laser treatment started after this visit.

history of trauma (likely vehicular trauma) and a complete fracture of the proximal third of the left femur, which was soon repaired with internal fixation (**Figure 1**). Postoperative radiographic evaluation at 8 weeks demonstrated no evidence of osteogenesis and the presence of a broken screw (**Figure 2**). Exercise restriction was recommended, and repeat radiographs were obtained 4 weeks later (12 weeks postsurgery). No clinical improvement was noted (**Figure 3**). The attending veterinarian diagnosed a delayed union, and, as the patient was still non-weight-bearing, the owner was considering amputation.

PRESENTATION

The patient was referred to Arlington Park Veterinary Services, in Kingston, Ontario, Canada, where laser therapy was instituted to attempt to stimulate bone healing and assist with pain relief before further surgery with possible bone grafting. Amputation was considered as a last resort if the patient did not improve.

TREATMENT

The patient received laser therapy (**Figure 4**) with a dose of approximately 10 J/cm² delivered at a power of 6 W continuous wave emission. Therapy was applied circumferentially to the area 3 times weekly for 30 days (12 treatments), then twice weekly for 2 weeks, and then once weekly for 2 weeks (18 total treatments).

Other therapies included controlled weight-bearing/balancing exercises and slow leash walking. Otherwise, crate rest was recommended. The laser therapist reported that the patient tolerated the treatments very well and was “comfortable and compliant” during her treatment sessions.

After 12 laser sessions (16 weeks postsurgery), improved bone healing was already noted radiographically (**Figure 5**), with only a small defect left at the fracture site. By 20 weeks postsurgery (after 18 laser sessions), complete union was achieved (**Figure 6**) and the patient was fully weight-bearing and sound at the completion of her treatment, according to her veterinarian.

DISCUSSION

The results of this case are not singular, and many small animal clinicians around the world have reported similar results from use of PBMT in treating delayed union or non-union fractures in their hospitals. Although appropriate recommendations for fixation and other standard of care treatments should always be made, practitioners are encouraged to consider the use of laser therapy as an adjunct to these treatments to aid in pain relief and speed healing.

Reference

1. Ebrahimi T, Moslemi N, Rokn AR, et al. The influence of low-intensity laser therapy on bone healing. *J Dent (Tehran)* 2012; 9(4):238-248.



FIGURE 4. Patient being treated at Arlington Park Veterinary Services.
 FIGURE 5. Radiograph of fracture obtained 16 weeks postoperatively.
 FIGURE 6. Radiograph of fracture obtained 20 weeks postoperatively.