

Use of photobiomodulation in immediate or delayed repair with heterologous fibrin biopolymer of injuries to the buccal branch of the facial nerve in rats

The seventh pair of cranial nerves, the facial nerve, is responsible for the maintenance and dynamics of the muscles of facial expression, its injury includes the loss of the patients' facial aesthetic, functional and psychological balance and can be caused by several factors such as: facial trauma, tumors, iatrogenesis, viral infections. The time for repair is a determining factor for functional success. In view of this, studies are important that propose to develop treatments or ways to accelerate the regeneration of the axon to the target organ in nerve repairs and the limitations with the classic end-to-end neuroorrhaphy with suture thread. The heterologous fibrin biopolymer and photobiomodulation therapy (laser) have shown promise. However, studies with such instruments have not yet been described in the literature with late repairs. Objectives: We analyzed, through two scientific articles, the peripheral effects of the repair of the lesion of the buccal branch of the facial nerve repaired with fibrin biopolymer associated or not with a simplified protocol of low-intensity laser therapy. Materials and methods: Male Wistar rats were divided into groups of 7 animals using the buccal branch of the facial nerve bilaterally (the left nerve was used for photobiomodulation), called: Control group - normal and laser; Denervated group - normal and laser; Immediate Repair Experimental Group - normal and laser; Delayed Repair Experimental Group – normal and laser. Delayed repair was performed 2 weeks after neurotmesis. All animals were euthanized after 6 weeks postoperatively. Analyzes were performed: histomorphometric analysis of the buccal branch of the facial nerve, histomorphometric analysis of the perioral muscles and functional analysis of the animals' vibrissae. Data were submitted to statistical analysis, considering a significance level of 5%. Results: In article 1, we observed a significant difference in nerve fiber and axon diameter between the group with immediate repair without laser and the experimental group with laser repair; in the muscle fiber area, the immediate laser repair group was similar to the control group. In article 2, in the histomorphometric parameters of the buccal branch of the facial nerve, we observed inferior results of the groups with delayed repair in relation to the groups with immediate repair and significant difference ($p < 0.05$) in the diameter of the

nerve fiber, the axon and the thickness of the sheath of myelin of the group with immediate repair with photobiomodulation with the other experimental groups. In the muscle fiber area, however, the delayed repair groups (normal and laser) were similar to the immediate repair group without laser. In the functional analysis, the late repair groups presented parameters of normality. Conclusions: Based on the two scientific articles, we demonstrated that the heterologous fibrin biopolymer and the photobiomodulation contribute to the morphofunctional regeneration of the buccal branch of the facial nerve and decrease the muscular atrophy of the facial muscles. Specifically, we observed that late repair of the buccal branch of the facial nerve is possible using the heterologous fibrin biopolymer, although it is poorer in relation to immediate repair, and that photobiomodulation with the new proposed protocol has a positive influence on regeneration results nervous on immediate repair.

Keywords: Facial nerve; Nerve regeneration; Muscle Denervation; Low-level laser therapy; Photobiomodulation; Fibrin tissue adhesive; Fibrin sealant; Biopolymers.