

Effect of Platelet Rich Plasma and Fibrin Sealant on Facial Nerve Regeneration in a Rat Model

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Objective: To investigate the effects of platelet rich plasma (PRP) and fibrin sealant (FS) on facial nerve regeneration. **Study Design:** Prospective, randomized, and controlled animal study. **Methods:** Experiments involved the transection and repair of facial nerve of 49 male adult rats. Seven groups were created dependant on the method of repair: suture; PRP (with/without suture); platelet poor plasma (PPP) (with/without suture); and FS (with/without suture) groups. Each method of repair was applied immediately after the nerve transection. The outcomes measured were: 1) observation of gross recovery of vibrissae movements within 8-week period after nerve transection and repair using a 5-point scale and comparing the left (test) side with the right (control) side; 2) comparisons of facial nerve motor action potentials (MAP) recorded before and 8 weeks after nerve transection and repair, including both the transected and control (untreated) nerves; 3) histologic evaluation of axons counts and the area of the axons. **Results:** Vibrissae movement observation: the inclusion of suturing resulted in overall improved outcomes. This was found for comparisons of the suture group with PRP group; PRP with/without suture groups; and PPP with/without suture groups ($P < .05$). The PRP without suture group had a significantly greater degree of recovery than the PPP without suture group ($P < .05$), but it did not have better performance than suture group ($P > .05$). The movement recovery of the suture group was significantly

better than the FS group ($P = .014$). The recovery of function of the PRP groups was better than that of the FS groups, although this did not reach statistical significance ($P = .09$). Electrophysiologic testing: there was a significantly better performance of the suture group when compared with the PRP and PPP without suture groups in nerve conduction velocity ($P < .05$). The PRP with suture group had the best results when compared with the suture as well as the PPP with suture groups in duration and latency-2 of MAP ($P < .05$). For the FS groups, no results were found demonstrating a biological effect. The PRP with suture group demonstrated the best performance in the latency-2 and the area under the curve of MAP when compared with the suture and FS with suture groups ($P < .05$). Histo-morphometric analysis: PRP with suture demonstrated the greatest increase in axon counts when compared with suture, FS with suture, and PPP with suture groups ($P < .05$). There was no statistically significant difference seen in axon diameter. **Conclusion:** The best results for the return of function in our rat facial nerve axotomy models occurred when the nerve ends were sutured together. At the same time, the data demonstrated a measurable neurotrophic effect when PRP was present, with the most favorable results seen with PRP added to suture. There was an improved functional outcome with the use of PRP in comparison with FS or no bioactive agents (PPP). FS showed no benefit over conventional suturing in facial nerve regeneration. Our study provides the potential of a new clinical application for PRP in peripheral nerve regeneration. **Key Words:** Facial nerve regeneration, platelet rich plasma, fibrin sealant.

Laryngoscope, 117:157-165, 2007