

ORIGINAL ARTICLE

Platelet-Rich Plasma Promotes Spinal Ligament Healing after Injury

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SUMMARY

Background: Spinal ligament injury is often a comorbidity in spine fracture. Although the spinal ligament is important to maintain spinal stability, little is done to improve its healing after injury. Platelet-rich plasma (PRP) has been shown effective in treating many tendon and ligament disorders, but its role in spinal ligament injury remains to be evaluated.

Methods: Supraspinous ligament and interspinous ligament were cut in rabbits to simulate spinal ligament injury after spine fracture. After the injury, the administration of autologous PRP was performed and compared with saline injection control. Morphology and histological analysis were utilized to assess PRP effect and compare it to the saline control group. To understand potential molecular mechanisms of PRP on ligamentous healing, bioinformatics analysis of the microarray dataset (GSE70918) from the Gene Expression Omnibus database was conducted.

Results: The PRP group was more likely to have a better appearance both morphologically and histologically than did the saline control group. Pathway analysis determined that IL-17 signaling pathway and TNF signaling pathway were the two significantly induced signaling pathways in tendon fibroblasts treated by PRP. In the protein-protein interaction network analysis, interleukin 6 had the highest degrees of connectivity.

Conclusions: PRP improves spinal ligament healing through the activation of pathways related to inflammation. Further studies are required to determine the dosing and timing of PRP administration to achieve better long-term treatment outcome.

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Supplementary Table

Table S1. DEGs between the two groups.

Gene symbol	log2FC
Cilp	-2.828
Plekha6	-2.716
C1qtnf3	-2.676
Fmod	-2.427
Jag1	-2.172
Aoc3	-2.072
Pgf	-2.069
Itga11	-1.957
Sgcg	-1.939
Tril	-1.901
Casq2	-1.891
Pln	-1.871
Anxa8	-1.857
Slc7a2	-1.854
Mustn1	-1.852
Parm1	-1.824
Hpgd	-1.81
Trib3	-1.759
Hspb7	-1.708
Fndc1	-1.676
Rarres1	-1.661
Gsta5	-1.656
Ramp1	-1.627
Lbh	-1.624
Actg2	-1.604
Ndrp1	-1.558
Nrep	-1.541
Prss23	-1.541
Itgb1	-1.537
Pltp	-1.534
Lmod1	-1.532
Tspan18	-1.489
Abi3bp	-1.484
Ogn	-1.46
Chac1	-1.459
Gpr34	-1.456
Fxyd1	-1.454
Mgst3	-1.424
Lims2	-1.413
Olfml2b	-1.408
Rarres2	-1.379
Kera	-1.356
Tnmd	-1.356
Etl4	-1.354

Col11a1	-1.35
Plxdc2	-1.317
Adarb1	-1.293
Mcam	-1.27
Cgref1	-1.258
Fat3	-1.244
Arhgap20	-1.239
Mylk	-1.237
Gria3	-1.237
Sult5a1	-1.231
Timp3	-1.227
Tnn	-1.221
Tgfb3	-1.218
Chmp4c	-1.205
Cpz	-1.197
Irs1	-1.179
Ckb	-1.176
Epha4	-1.173
Olr1313	-1.168
Dmpk	-1.164
Mir24-1	-1.156
LOC100912676	-1.156
Nkd2	-1.148
Rgcc	-1.145
Prss35	-1.141
Gas6	-1.14
Uts2r	-1.14
Sulf2	-1.123
Acta1	-1.119
Itpr1	-1.115
Pth1r	-1.107
Bves	-1.106
Cldn1	-1.1
Pcp4l1	-1.099
Bmp3	-1.093
Gng3	-1.092
Lgr5	-1.087
Itga8	-1.084
Csrp2	-1.081
Slc7a11	-1.074
Rnf144a	-1.067
Myo7a	-1.063
Cryab	-1.058
Lbp	-1.058
Ssc5d	-1.058
Coro1a	-1.058
Vldlr	-1.051

Table S1. DEGs between the two groups (continued).

Gene symbol	log2FC
Egr2	-1.048
Col5a3	-1.031
Chrdl1	-1.023
Fam71f1	-1.009
Olr1699	-1.009
Adam23	-1.008
Sbspon	-1.001
Dhrs9	1.001
Mir3554	1.006
Plscr1	1.018
Nfkbia	1.033
Arhgap8	1.04
Xkrx	1.05
Klhl41	1.054
Gsap	1.055
Mir31	1.09
Il18rap	1.114
Elmod1	1.116
Syt17	1.12
Nabp1	1.129
Cyp7b1	1.137
Sprr1a	1.144
Cst6	1.15
Mt2A	1.151
Adora2b	1.153
Fgf10	1.167
Nqo2	1.179
Serinc2	1.18
Ccbe1	1.189
Plscr2	1.201
Esm1	1.204
Sod2	1.209
Ednrb	1.211
Il33	1.246
Slc16a2	1.249
Ccl20	1.253
Usp18	1.287
Glrx	1.394
Mmp13	1.457
LOC681355	1.47
Hmga2	1.498
Tlr2	1.506
Angptl4	1.506
Shc4	1.531
Pr18a9	1.544

Msln	1.546
Ptx3	1.601
Fabp4	1.606
Gna14	1.615
Cxcl16	1.661
Twist2	1.671
Wnt5a	1.689
C3	1.713
Ccl2	1.723
Il6	1.744
Agtr1a	1.762
Adm	1.767
Krt7	1.782
Slpi	1.818
Pf4	1.852
Npy	1.866
Ptgs2	1.885
Pla2g2a	1.918
Ccl7	1.954
Upp1	1.989
Gja5	2.028
Mmp10	2.042
LOC685067	2.161
Mmp9	2.42
Prl7a3	2.436
Stc1	2.969
Il1a	3.103
Prl6a1	3.142
Mmp3	3.149
Lcn2	4.063
Cxcl1	4.38