Masters Thesis: Proliferation of Osteoblasts in vitro when subjected to optimum concentrations of PRP & rhBMP-2

Abstract

Objectives: The aims of this study were to (1) ascertain the optimal concentrations of platelet rich plasma (PRP) for osteoblast proliferation *in vitro*. (2) To determine which is most effective at promoting osteoblast proliferation: PRP or rhBMP-2 when used at optimal concentrations over a 7 day and 14 day period.

Materials and methods: (1) Human osteoblast cells (HOB) were seeded at a density of 5000 cells/ml on a 24 well plate. PRP was prepared using a standard protocol and was added at concentrations ranging from 50% to 1.5% (v/v). The cells were kept in a 37°C incubator at 5% CO_2 for 24 hours. DNA content for each well was measured using Hoechst 33258 and Calf thymus as the DNA standard. Statistical analysis was performed using one-way ANOVA. (2) HOB cells were seeded on two 24 well plates at a density of 5000 cells/ml. Optimal concentrations of PRP and rhBMP-2 were added and the plates kept in a 37°C incubator at 5% CO_2 for 7 days and 14 days respectively. Manual cell counts were performed on the cell suspensions using a Neubauer chamber.

Results: (1) A PRP concentration of 12.5% (v/v) gave osteoblast proliferation which was significantly different from controls (SC) ($P = 0.012$) and when compared with a lower concentration of 3.125% ($P = 0.034$). (2) At week one PRP showed an increase in proliferation of 7145% when compared with controls. RhBMP-2 showed a decrease in cell proliferation of 5%. After 2 weeks incubation the greatest mean cell count for PRP was 49.5×10^4 cells/ml at a concentration of 12.5% (v/v). In comparison the greatest mean cell count for rhBMP-2 was 6.5×10^4 cells/ml at a concentration of 15ng, which is 86.8% less than the PRP.

Conclusion: PRP at 12.5% v/v, showed a significant enhancement in cell proliferation (3299% against controls), in contrast rhBMP-2 was found to be less effective (325% against controls). These results suggest that autologous PRP has a favourable potential role in bone regeneration in clinical applications.