ABSTRACT

The Effect of Additional Platelet Rich Fibrin (PRF) on Adipose derived Mesenchymal Stem Cell (AMSCs) Differentiation into Cardiomyocytes In Vitro

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Background: *Coronary artery disease among other cardiovascular disease strongly influenced the quality of life. Whereas human adult cardiomyocytes has limited capacity for regeneration. The irreversible loss of cardiomyocytes can lead to progressive ventricular remodeling of nonischaemic myocardium. Clinically there is no treatment to regenerate the infarcted myocardium. On this basis, cell therapy is an ideal treatment to regenerate the damaged cardiac area. Obtaining adipose-derived stem cells (AMSCs) increases yields and reduces the pain in a simple procedure compared to BMSCs. And platelet rich fibrin (PRF) is the newest revolution of platelet therapy which appears to have the ability to induce cardiomyocytes differentiation.*

Objective: *To analyze the effect of additional PRF on the AMSCs differentiation into cardiomyocyte compared with the group without additional PRF.*

Methods: *This study is a true experimental randomized post-test design study. AMSCs were isolated from adipose tissues and cultured until 4 passages. The characteristics of AMSCs were measured by the expression of CD 34-, 45-, and CD 105+ using flowcytometry. The samples were divided into 3 groups, i.e. negative control (α-MEM), positive control (differentiation medium) and treatment group (PRF). The assessment of GATA-4 marker expression was conducted using flowcytometry on the fifth day and cTnT was conducted using immunocytochemistry on the tenth day to determine the differentiation to cardiomyocyte. Data analysis was conducted using T-test and One-Way ANOVA on normally distributed data determined through Shapiro Wilk test.*

Results: *Flowcytometry on GATA-4 expression revealed significant difference on PRF group compared with negative and positive controls (*68.20 ± 6.82 vs 58.15 ± 1.23 $p<0.05$; 68.20 ± 6.82 vs 52.96 ± 2.02 $p<0.05$*). This was supported by the results of immunocytochemistry on troponin expression which revealed significant difference between PRF group compared with negative and positive controls (*50.66 ± 7.2 vs 10.73 ± 2.39 $p<0.05$; 50.66 ± 7.2 vs 26.00 ± 0.4 $p<0.05$*). This was in line with the hypothesis which stated that there was an effect of additional PRF on AMSCs differentiation into cardiomyocytes.*

Conclusion: *Additional PRF on AMSCs differentiation significantly improve the differentiation into cardiomyocytes measured by GATA-4 and cTnT expressions.*

Keywords: *Adipocyte-derived mesenchymal stem cells, platelet rich fibrin, growth factor, stem cell therapy*

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AMSCs	*Adipocyte-Derived Mesenchymal Stem Cell*
Ang-II	*Angiotensin-II*
ASCs	*Adipose stem cells*
Aza	*Azacytidine*
BMPs	*Bone Morphology Proteins*
BMSCs	*Bone Marrow-Derived Mesencyhmal Stem Cells*
CD	*Cluster of Differentiation*
cTnT	*Cardiac Troponin T*
EGF	*Epidermal Growth Factor*
END-2 cells	*Endoderm-Like cells*
ESCs	*Embryonic Stem Cell*
FGFs	*Fibroblast Growth Factors*
IGF	*Insulin-Like Growth Factor*
ISCT	*International Society of Cellular Therapy*
miR	*Micro RNA*
MLC	*Myosin Light Chain*
MSCs	*Mesenchymal Stem Cells*
PBS	*Phosphate Buffer Saline*
PDGF	*Platelet-Derived Growth Factor*
PLA cells	*Processed Lipoaspirate Cells*
PRF	*Platelet Rich Fibrin*
PRP	*Platelet Rich Plasma*
SVF	*Stromal-Vascular Fraction*
TGF	*Transforming Growth Factor*
VEGF	*Vasoendothelial Growth Factor*
WHO	*World Health Organization*