The Effectiveness of Incorporation Process of Platelet-Rich Plasma in Gelatin Hydrogel Bone Graft between Impregnated and Drop Method

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Abstract

Introduction. Tissue Engineering which involve three main component such as bone graft, platelet-rich plasma (PRP) and cells is expected to support in bone regeneration. Gelatin hidrogel bone graft is planted have a function as cell environment and PRP provide growth factor to support differentiation of cells. The success of tissue engineering is affected by number of PRP which is contained in bone graft. **Purpose.** The purpose of this study is to compere incorporation process between impregnated and drop method to gelatin hidrogel bone graft. **Methods.** This study was experimental research, Post Test Design that involve three donors for blood collection. PRP was prepared by taken 10ml of bloods for each donor. All of bloods were centrifugated twice using refrigerated centrifuge. The PRP was collected from the 2nd centrifugation by pipeting between buffy coat and red blood cell layer, then was incorporated into gelatin hydrogel bone graft. The effectiveness incorporation wascompared between impregnated and drop method. **Results.** Data were analyzed using independent sample t test. Result show the significant was 0,262 (p>0,05) its mean there's no significane different between impregnated and drop method. **Conclusions.** There's no significant difference incorporation process between impregnated and drop methods. The number of platelet which incorporated in bone graft were effected by characteristic of bone graft such as structure, interface adherence, porosity and swelling ability. The good characteristic of bone graft could be obtain from synthesis and good fabrication technique
.

Key words : Tissue engineering, gelatin hidrogel bone graft, platelet-pich plasma, incorporation process

Introduction

Tissue Engineering which involve three main component such as scaffold (bone graft), molecule signaling and cells. are expected to support in bone regeneration.[1] Gelatin hidrogel as a scaffold is planted have a function for cell environment.[2] To provide signaling molecules, we considered autologous growth factors from PRP as a good candidate to provide signaling molecules needed for cells to proliferate.[1,3,4] The success of tissue engineering is affected by numbers of PRP which is incorporated in scaffold/bone graft.

Objective

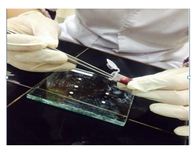
The purpose of this study is to compere incorporation process between impregnated and drop method to gelatin hidrogel bone graft

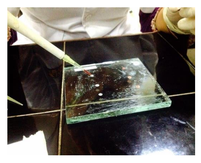
Methods

Platelet-Rich Plasma preparation

Whole blood for PRP preparation was obtained from heathy volunteers aged 20-45 year old.
Informed consent was obtained referred Health and Medical Research Ethics Committee of Universitas Muhammadiyah Yogyakarta, Indonesia.

Impragnated method



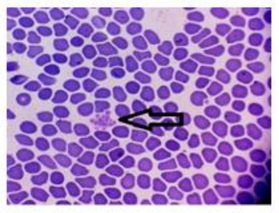


Drop method

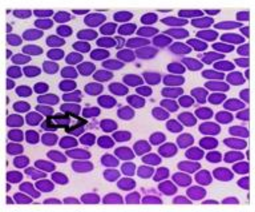
Results

Increased number of platelets after PRP processing

Blood sample	Platelet ammount		
	Whole Blood (platelet/µl)	PRP (platelet/µl)	Folded
Volunteer 1	109	743	6,8165
Volunteer 2	178	564	3,1685
Volunteer 3	226	578	2,5575



giemsa *Whole Blood*



giemsa PRP

Blood sample		Platelet incorporated	
		Impragnated (platelet/µl)	Drop (platelet/µl)
volunteer 1	1	57	-7
	2	-37	-109
	3	-11	-509
volunteer 2	1	94	44
	2	50	94
	3	118	178
volunteer 3	1	-64	106
	2	58	122
	3	-2	166

		Levene's Test For Equality of Variance		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Eror Difference
Platelet incorporated	Equal Varince assumed	19,971	0,001	0,973	13	0,348	24,54077	25,22498
	Equal Varince not assumed			1,207	8,002	0,262	24,50477	20,33764

Discussion

- The number of platelet which incorporated in bone graft were effected by characteristic of bone graft such as structure, interface adherence, poro-sity and swelling ability.[5]
- The good characteristic of bone graft could be obtain from synthesis and good fabrication technique.[6]
- Scaffold desain has an important role to affect cells-materials interaction. The suitable scaffold will provide a framework and initial support for the cells to attach, proliferate and diffe-rentiate, and form an extracellular ma-trix (ECM).[7] Including the incorporation signal molecules into scaffold is determined of important characteristic of the scaffold.

Conclusion

1. There's no significant difference incorporation process between impregnated and drop methods.
2. The effectiveness of incorporation is determined of characteristic of the bone graft

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Acknowledgement

This project and publication were made possible by:

Faculty of Medicine and Health Science, Universitas Muhammadiyah Yogyakarta "kemitraan" research funding 2014.

This poster is presented at DREAM2016 Dental Research Exhibition and Meeting