



THE EXPRESSION OF TYPE 1 COLLAGEN ON WOUND HEALING OF DENTAL EXTRACTION USING CHITOSAN GEL WITH DIFFERENT VISCOSITY (RESEARCH ARTICLE)



Sularsih *, Endah Wahjuningsih**

*Departement of Dental Material, Faculty of Dentistry, Hang Tuah University

**Departement of Oral Biology, Faculty of Dentistry, Hang Tuah University

ABSTRACT

Purpose. Type 1 collagen is significant constituent of natural extracellular matrix that important in wound healing process of dental extraction. The viscosity of chitosan gel could influences the performance on many application. The aim of this study was to account expression of type 1 collagen on wound healing process of dental extraction in *Rattus norvegicus* for 7, 14 and 21 days using chitosan gel with high and low viscosity. **Materials and methods.** *Rattus norvegicus* strain wistar male, aged 8-16 weeks, divided into 3 groups, namely group I which given chitosan gel with high viscosity, group II which given chitosan gel with low viscosity and group III as control which were not given chitosan gel. Chitosan gel were applied into the socket of dental extraction. Rat was decapitated 7, 14 and 21 days after chitosan gel application and the jaw in the treated regions and control group were cut for immunohistochemical examination using type 1 collagen monoclonal antibody to observe collagen type I. Data were analyzed using ANOVA test. **Results.** The result showed significant differences in type 1 collagen for 7, 14 and 21 days observation ($p < 0,05$). The expression of type 1 collagen were found higher in the group which given chitosan gel with high viscosity. **Conclusion.** Chitosan gel with high viscosity have a good mucoadhesive properties that can stimulate the expression of type 1 collagen on wound healing process of dental extraction.

Keys words: Chitosan gel, type 1 collagen, viscosity

Correspondence: Sularsih, c/o: Departement of Biomaterial, Dentistry faculty of Hang tuah University, Arif Rachman Hakim 150 Surabaya. E-mail: larsihdentist@gmail.com

BACKGROUND AND METHODE



RESULT

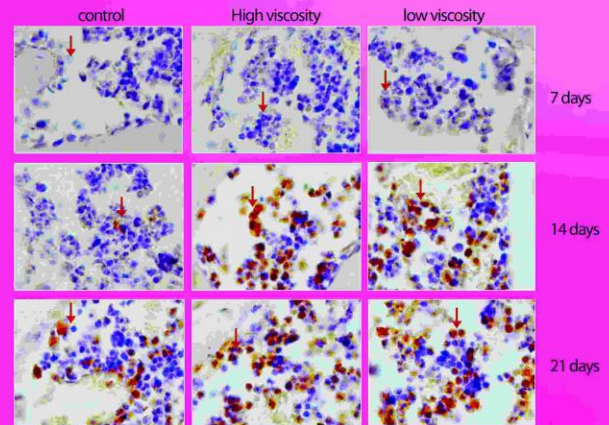


Figure 1. The figure of type 1 collagen on 7, 14 and 21 days using chitosan with different viscosity and control group

Table 1. The mean and standard deviation of each group at 7, 14 and 21 days

Variable	Treatment	7 days Mean± SD	14 days Mean± SD	14 days Mean± SD
Type 1 Collagen	Control	10.0±3.03	13.0±2.31	12.33±1.75
	Chitosan, High viscosity	16.50±4.12	16.50±2.58	19.14±2.19
	Chitosan, low viscosity	11.40±1.34	15.50±2.72	12.33±1.63

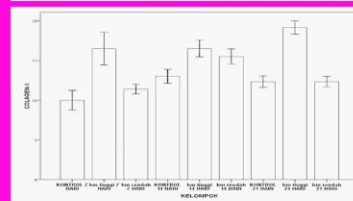


Figure 2. The graphic of type 1 collagen on 7, 14 and 21 days using chitosan with different viscosity and control group

DISCUSSION

- The viscosity of chitosan gel with high molecular weight powder more higher than formulation with low molecular weight. Molecular weight and particle size are related to length of molecular chain, more longer the molecular chain, the viscosity more higher. The amount of dissolved material and temperature also affects the viscosity. Temperature affects the internal movement, the higher of temperature make the movement of particle size and due to lower the viscosity.^{1,2}
- Chitosan biodegradation by lysozim that can change chitosan polymer form (N-acetyl-D-glucosamine) to dimer active form. N-acetyl-D-glucosamine dimer active form cross-linked with glycosaminoglycan and glycoprotein that part of matrix macromolecules extracellular as well as stimulate increased Transforming growth factor beta 1 (TGF-β 1) and Fibroblast growth factor 2 (FGF 2), which also activates the synthesis of collagen in fibroblast.^{3,4}

REFERENCE:

1. Wathoni N, Soebagio B, Rachim AM. 2009. The formulation of chitosan gel antioksidan. Journal of pharmacology, Vol:7, No:3 Available from <http://pustaka.unpad.ac.id/archives/79161/>. Accessed October 11, 2013
2. Rochima E, Suhartono MT, Syah D, Sugiono. 2007. The viscosity and molecular weight chitosan from chitin deacetylase enzymatic reaction Isolat *Bacillus Papandayan*. National Congress of Agricultural Association (PATPI), Bandung, pp 2-10
3. Chin L, Halim AS. 2009. In vitro models in biocompatibility assessment for biomedical-grade chitosan [derivatives in wound management]. J. Molecular Science. Vol 10, No 3. pp. 1300-1313
4. Ueno H, Nakamura F, Mukarami M, Okumura M, Kadosawa T, Fujinaga T. 2001. Evaluation effects of chitosan for the extracellular matrix production by fibroblasts and growth factors production by macrophages. J. Biomaterials. Vol 22. pp. 2125-2130.

CONCLUSION

Chitosan gel with high viscosity have a good mucoadhesive properties that can stimulate the expression of type 1 collagen on wound healing process of dental extraction.