A novel micro-injector for micro injection in dental application

Micro-injection technology is widely used in clinical surgery. Herein, periodontal disease is to be a starting point, we will develop a novel micro-injector carrying bone graft substitutes for repairing bone defect to minimizing the patient's discomfort.

Periodontal disease, an infectious disease of the gingival tissue, might lead to a bone defect, even tooth loss. Traditionally, repairing bone lost from periodontal disease is widely by guide bone regeneration (GBR) which utilizes a barrier membrane with bone graft sealing off the cavity site of bone. However, during the GBR surgical process, it needs a stable barrier membrane and creates a new creative space during surgical process so that most patients don't like the wound cavity created by surgical process. Therefore, we hope to develop a new micro-injector instead of the traditional GBR method for reconstruct bone defects in periodontal disease.

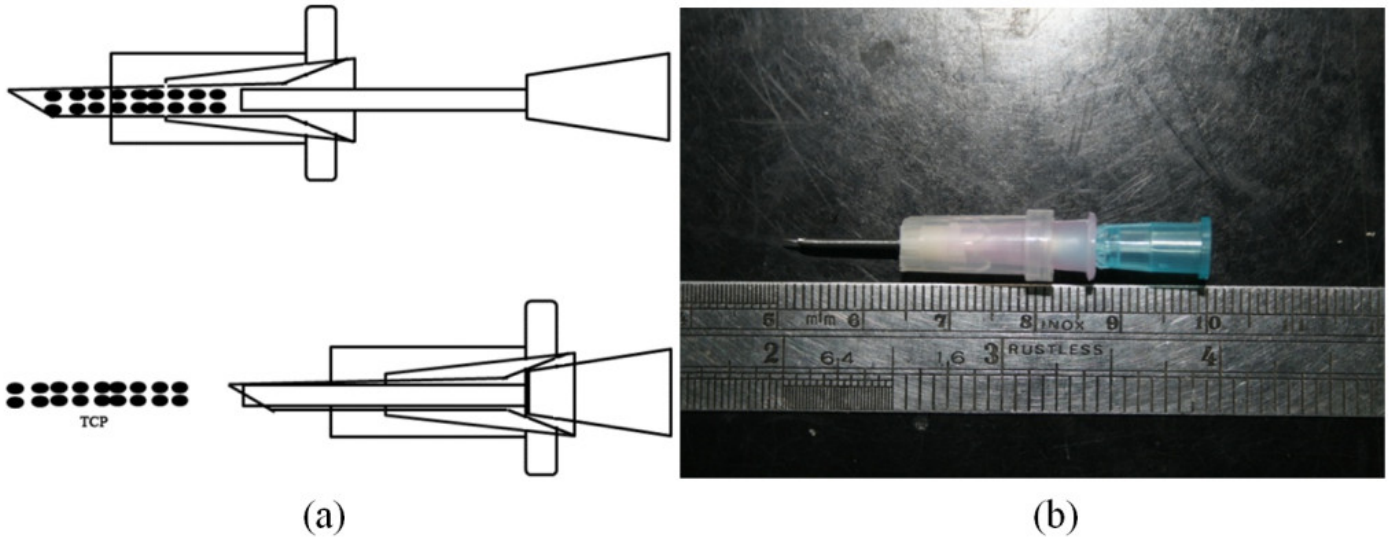

Fig. 1. (a) The schematic diagram of double-tube structure of dental micro- injector. (b) The picture of novel dental micro-injector.

In this study, the structure of novel micro-injector is designed to possess double tubes (embedding portion and injected portion) and easy for handling (Fig. 1 (a)). The embedding portion fills with tricalcium phosphate (TCP), a bone substitute which could promote bone formation. Additionally, the total length of dental micro-injector was only 4.8 cm which is smaller than commercial clinical syringe (Fig. 1 (b)) and is very convenient to manipulate.

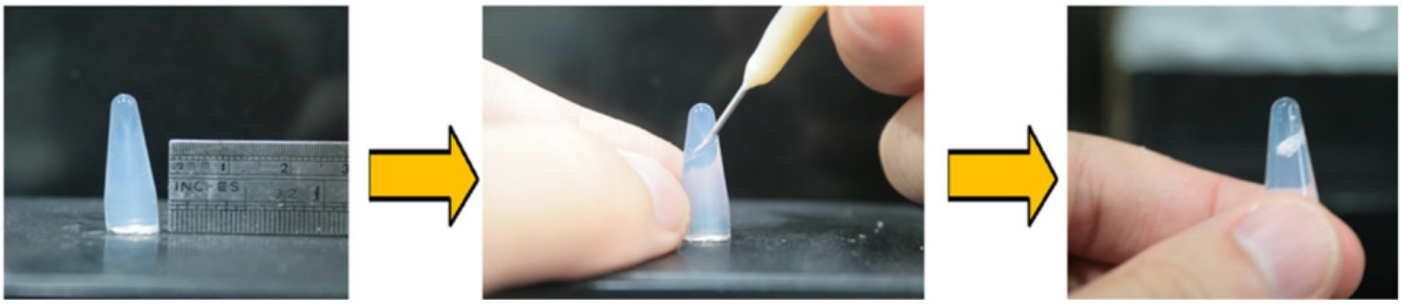

Fig. 2. Using agarose gel model for observing the distribution of ejected bone substitues from micro-injector to evaluate the feasibility of micro-injector. (a) The morphology of agarose gel without micro-injection. (b) Agarose gel before micro-injection and (c) distribution of bone graft substitutes after micro-injection of bone graft substitutes, TCP, into the agarose gel.

Furthermore, to estimate the feasibility of dental micro-injector, a soft agarose gel *in vitro* model (Fig. 2) is used to mimic a soft alveolar tissue. The model shows that TCP carried by the micro-injector could be injected into agarose gel easily, having only a small invasion wound, and avoiding flap operation for the patients. Therefore, the micro-injector provides a new concept of device carrying the bone graft substitutes in repairing the bone defects from periodontal diseases. We believe that is very encouraging and worthy for further clinical applications.

Publication

Novel microinjector for carrying bone substitutes for bone regeneration in periodontal diseases.
Tsai HC, Li YC, Young TH, Chen MH
J Formos Med Assoc. 2015 Jun 10