Chapter 8

General summary
As one of the nature-derived scaffold material, coralline hydroxyapatite (CHA) has an inner calcium carbonate core and an outer hydroxyapatite layer\textsuperscript{1-2}. CHA has been proved to be a potential bone substitute in some preclinical studies\textsuperscript{3-5}. However, in some previous clinical researches, low biocompatibility of coral-derived has been proved\textsuperscript{6-9}. In chapter 2, a well-developed biomimetic calcium phosphate coating technique was first used with CHA to enhance its biocompatibility and osteoinductivity at ectopic sites in rats. The volume of newly formed bone, bone marrow, and foreign body giant cells was calculated for the evaluation of osteogenesis and biocompatibility.

In the last 20 years, the biomimetic calcium phosphate coating technique has been used in lots of preclinical research and proved its excellent osteoconductivity, biocompatibility\textsuperscript{10-12}. They can be rendered osteoinductive by incorporating an osteogenic agent, such as bone morphogenetic protein 2 (BMP-2), into the crystalline latticework in physiological situations. The biomimetic calcium phosphate coating enables a controlled, slow and local release of BMP-2, which mimics a physiologically similar release mode, to achieve sustained ectopic or orthotopic bone formation. Therefore, biomimetic calcium phosphate coatings are considered to be a promising delivery vehicle for osteogenic agents. In chapter 3, we reviewed biomimetic calcium phosphate coating technique about its preparation, physicochemical properties, potential as a drug carrier, and their pre-clinical application both in ectopic and orthotopic animal models.

To know the volume of bone, bone marrow and remaining scaffold material is paramount in bone tissue engineering. To this end, Cavalieri principle was used for the measurements of volume by the analysis of sections from a sample. Manual planimetry and point counting methods are two commonly used Cavalieri’s principle based method. Until now, there is considerable controversy over the accuracy, precision, and efficiency between these two methods due to the lack of a reliable gold standard. In chapter 4, we compared these three parameters of manual planimetry and point counting method with the presence of a simple and reliable gold standard.
Animal models play a significant role in the diagnosis and treatment of peri-implantitis. One of the animal models most commonly used is the Beagle dog. In chapter 5, we developed a new method for a peri-implantitis model in beagle dogs in which a stainless steel ligature (SSL) was used independently. SSLs were placed in a submarginal position of implants to induce peri-implantitis and were not replaced during the 12-week tissue breakdown period.

Air polishing was first developed for the cleaning of supra-gingival surfaces of natural teeth by spraying the mixture of abrasive powder and compressed water. The cleaning efficiency of air polishing has been proved by in vivo and in-vitro studies. In chapter 6, in order to maximize the clinical usage of air polishing method and to unravel the influence of the different device settings, pocket depths and cleaning movements, we investigate the behaves of air-polishing on a titanium surface by evaluating the size and the shape of the cleaned area.
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