Sintesis dan karakterisasi komposit berbasis kalsium fosfat kitosan sebagai biomaterial pengisi tulang mampu injeksi = Synthesis and characterization composite based calcium phosphate chitosan as injectable bone substitute biomaterial

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Abstrak

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Injectable bone substitute (IBS) merupakan metode penanganan kerusakan tulang yang efektif, karena dapat mempermudah proses operasi dan memberi kenyamanan bagi pasien. Penelitian ini bertujuan untuk mengembangkan material pengisi tulang mampu injeksi berbasis kalsium fospat dengan perbandingan Ca/P (1.67) dan kitosan. Sintesis dilakukan dengan cara mencampurkan semen kalsium fosfat dan kitosan sebesar 0%, 4%, 8%, 11% dalam larutan Na2HPO4 (1mol/L) yang kemudian dicetak dan dipanaskan pada suhu 370C selama 2 jam. Sampel hasil percobaan kemudian dikarakterisasi dengan XRD, SEM, FTIR, serta pengujian kemampuan injeksi dan setting time. Dari hasil karakterisasi tersebut didapatkan bahwa proses injeksi yang baik dapat dilakukan dengan perbandingan larutan dan serbuk (0.68 ml/gram). Setting time dan kekuatan tekan meningkat dengan penambahan kitosan, sedangkan modulus kompresi-nya berkurang dari 140-106 MPa. Terbentuknya senyawa HA yang diindikasikan dari uji XRD serta hasil uji FTIR menunjukkan tidak ada ikatan secara kimia antara semen kalsium fospat (HA,DCPD) dan kitosan, melainkan berupa ikatan hidrogen. Adapun hasil karakterisasi menunjukkan bahwa produk IBS yang telah disintesis berpotensi untuk dijadikan material pengisi tulang.
ABSTRACT
Injectable bone substitute (IBS) is an effective methode to treat bone damage, because it can provide a minimun surgical and make the patient feel comfort. The aim of this study is to make injectable calcium phosphate-based bone substitute material with a ratio of Ca/P (1.67) and chitosan. Synthesis was performed by mixing calcium phosphate cement and chitosan at 0, 4, 8, 11 wt.% in Na2HPO4 (1 mol/L) as a solvent. Sampels were then characterized by using XRD, SEM, FTIR, injectability and seting time. The results showed that the injection process can be performed with liquid and powder rasio of 0.68 ml/g. Setting time and compression strength increases with the addition of chitosan, while its Young's modulus decreases. Formation of HA indicated by XRD and FTIR showed that there is no chemical bond between calcium phosphate cement (HA, DCPD) and chitosan, but in the form of hydrogen bonds. Based on the aforementioned data, the results showed that IBS produced in this work has the potential to be used as a bone substitute material.
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