Analisis perbandingan desain miniplate dan screw logam magnesium ecap terhadap titanium = Comparative analysis of miniplate design and metal magnesium screw ecap against titanium

Evi Febriani Listio Rahayu, author

Abstrak

ABSTRAK
 Latar Belakang Pada penatalaksanaan fraktur maksilofasial secara internal fiksasi diperlukan pemasangan alat miniplate dan screw sampai terjadi penyembuhan tulang Magnesium memiliki potensi sebagai miniplate dan screw pada tulang rahang dengan syarat bersifat biokompatibel dan biodegradasi sehingga tidak diperlukan operasi kembali untuk pengambilan miniplate dan screw Proses equal channel angular pressing ECAP merupakan salah satu metode untuk mengontrol laju korosi logam magnesium dan meningkatkan sifat mekanisnya Untuk pembuatan desain miniplate dan screw dari magnesium ECAP dengan merujuk dari desain safety factor bahan titanium yang biasanya telah digunakan perlu disesuaikan dengan material properti magnesium agar dapat mencegah kerusakan Tujuan menganalisa perbandingan desain miniplate dan screw logam magnesium ECAP terhadap titanium Metode Untuk penelitian ini kami menggunakan metode finite elemen yaitu formulasi perpindahan untuk menghitung perpindahan komponen strain dan tekanan di bawah beban internal dan eksternal Kemudian desain miniplate dan screw dari magnesium ECAP dilakukan analisa simulasi pembebanan yang dianalisa menggunakan teori Von Misses Hasil Hasil desain miniplate dan screw magnesium ECAP yang diharapkan dapat digunakan pada penatalaksanaan fraktur maksilofasial telah dilakukan simulasi pembebanan dengan dilakukan analisa desain menggunakan teori Von Misses kemudian desain direkayasa untuk mengurangi stress yang diterima desain rekayasa magnesium ECAP dibuat menjadi dua tipe yaitu tipe 1 dengan menambah jumlah screw menjadi 8 screw dengan berat total miniplate dan screw sebesar 118 212 mg dan tipe ke 2 dengan merubah diameter head screw menjadi 2x lebih besar dari bentuk semula sehingga berat totalnya sebesar 169 414 mg Kesimpulan Desain alternatif miniplate dan screw magnesium ECAP tipe 1 dapat lebih efektif untuk digunakan pada penatalaksanaan fraktur maksilofasial ABSTRACT
 Background In the internal fixation management of maxillofacial fractures the placement of miniplate and screw is necessary until bone repair takes place Magnesium has the potential as a miniplate and screw for the jaws with it rsquo s biocompatibility and biodegradability so that a follow up surgery to remove the miniplate and screw is not necessary The equal channel angular pressing ECAP process is a method to control the corrosion rate of magnesium and increase the mechanical properties In the making of miniplate and screw design from ECAP magnesium referring the safety factor of the titanium design that is already being used adjustments must be made with the characteristics of magnesium so damage can be avoided Objectives to analyze the comparison between magnesium ECAP miniplate and screw design against titanium Methods For this research we used the finite element method which is displacement formulation to calculate component movement strain and pressure under the internal and external load Afterwards the magnesium ECAP miniplate and screw design undergoes a loading simulation which is analyzed with the Von Misses theory Result Design of miniplate and screw magnesium ECAP which expected to be used in the management of maxillofacial fractures has been tested with the stress simulation using Von Misses theory then the design engineered to reduce stress received Engineering design of magnesium ECAP divided into two types type 1 by increasing the number of

screw into 8 screws with a total weight miniplate and screws with a total weight miniplate and screw amounted to 118 212 mg and type 2 by changing the diameter of the head screw becomes large than its original shape so that the total weight of 169 414 mg Conclusion Design alternative of miniplate and screw magnesium ECAP type 1could be more effective to be used in the management of maxillofacial fracture ;Background In the internal fixation management of maxillofacial fractures the placement of miniplate and screw is necessary until bone repair takes place Magnesium has the potential as a miniplate and screw for the jaws with it rsquo s biocompatibility and biodegradability so that a follow up surgery to remove the miniplate and screw is not necessary The equal channel angular pressing ECAP process is a method to control the corrosion rate of magnesium and increase the mechanical properties In the making of miniplate and screw design from ECAP magnesium referring the safety factor of the titanium design that is already being used adjustments must be made with the characteristics of magnesium so damage can be avoided Objectives to analyze the comparison between magnesium ECAP miniplate and screw design against titanium Methods For this research we used the finite element method which is displacement formulation to calculate component movement strain and pressure under the internal and external load Afterwards the magnesium ECAP miniplate and screw design undergoes a loading simulation which is analyzed with the Von Misses theory Result Design of miniplate and screw magnesium ECAP which expected to be used in the management of maxillofacial fractures has been tested with the stress simulation using Von Misses theory then the design engineered to reduce stress received Engineering design of magnesium ECAP divided into two types type 1 by increasing the number of screw into 8 screws with a total weight miniplate and screws with a total weight miniplate and screw amounted to 118 212 mg and type 2 by changing the diameter of the head screw becomes large than its original shape so that the total weight of 169 414 mg Conclusion Design alternative of miniplate and screw magnesium ECAP type 1could be more effective to be used in the management of maxillofacial fracture ;Background In the internal fixation management of maxillofacial fractures the placement of miniplate and screw is necessary until bone repair takes place Magnesium has the potential as a miniplate and screw for the jaws with it rsquo s biocompatibility and biodegradability so that a follow up surgery to remove the miniplate and screw is not necessary The equal channel angular pressing ECAP process is a method to control the corrosion rate of magnesium and increase the mechanical properties In the making of miniplate and screw design from ECAP magnesium referring the safety factor of the titanium design that is already being used adjustments must be made with the characteristics of magnesium so damage can be avoided Objectives to analyze the comparison between magnesium ECAP miniplate and screw design against titanium Methods For this research we used the finite element method which is displacement formulation to calculate component movement strain and pressure under the internal and external load Afterwards the magnesium ECAP miniplate and screw design undergoes a loading simulation which is analyzed with the Von Misses theory Result Design of miniplate and screw magnesium ECAP which expected to be used in the management of maxillofacial fractures has been tested with the stress simulation using Von Misses theory then the design engineered to reduce stress received Engineering design of magnesium ECAP divided into two types type 1 by increasing the number of screw into 8 screws with a total weight miniplate and screws with a total weight miniplate and screw amounted to 118 212 mg and type 2 by changing the diameter of the head screw becomes large than its original shape so that the total weight of 169 414 mg Conclusion Design alternative of miniplate and screw magnesium ECAP type 1could be more effective to be used in the management of maxillofacial fracture