Biomechanic Comparison Of Repaired Tibial Bone Versus Anatomical Tibial Bone In A Sheep Model

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INTRODUCTION:

The goal standard treatment for a bone defect would be placement of autologous bone graft. This biomechanic study is between newly invented dual density hydroxyapatite scaffold with a bone growth stimulating agent in compared to the gold standard tricortical autograft.

MATERIALS & METHODS:

A pilot study using a sheep as model for treatment of critical sized defect. Comparison was made between 3 control sheep(Autologous bone graft) and 3 subject sheep, both which 3cm critical sized defect was made on its left tibia with later implanted with tissue engineered bone (TEB) with autologous plasma and marrow derived stem cells that being stabilized with biplanar external fixator.

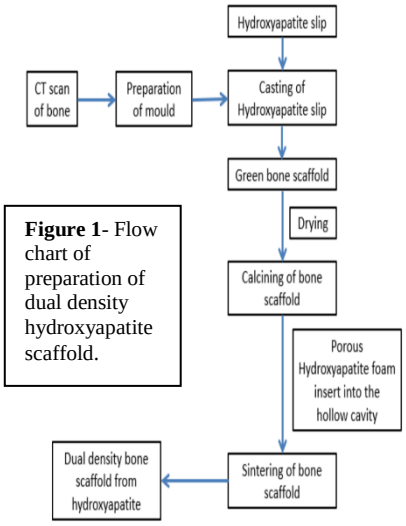

Figure 1- Flow chart of preparation of dual density hydroxyapatite scaffold.

RESULTS

Union at the interfaces of the graft was seen after 5 months radiologically. This was later confirm histologically. Biomechanic testing was performed at this interfaces. It shows that in all 3 sample the proximal and distal interface of autologous bone graft shows higher sheer strength compared to the scaffold, but the 2nd proximal scaffold sample shows comparable result with autologous bone graft.

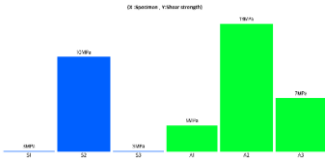

Figure 2. Comparison of proximal interface sheer strength of both scaffold (S) and autologous bone graft

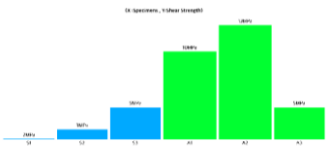

Figure 3 Comparison of distal interface sheer strength of both scaffold (S) and autologous bone graft (A).

DISCUSSION:

This biomechanic study shows that dual density hydroxyapatite scaffold has a good mechanical strength in compare to autologous graft. The hallmark of this study is the invention of dual density scaffold by hydroxyapatite (HA). The outer dense layer provides the mechanical stability and the inner porous layer facilitates vasculature in promoting osteogenesis thus providing an alternative method to treat critical size bone defect.

Figure 4- Dual density scaffold with bone ingrowth

CONCLUSION:

Dual density hydroxylapatite scaffold is an alternative bone substitute to treat bone defects.

REFERENCES:

1.Komaki H et al.Repair of segmental bone defects in rabbit tibiae using a complex of beta-tricalcium phosphate, type I collagen, and fibroblast growth factor-Biomaterials. 2006;27(29):