

Dual Density Hydroxyapatite Bone Scaffold With Autologous Mesenchymal Stem Cell In Treating Critical Bone Defect

Abdullah Sani MH¹; Mohd Yazid B¹; Hwei ANM²

¹Department Of Orthopedic And Traumatology, Hospital Universiti Kebangsaan Malaysia, Kuala Lumpur

²Department Of Tissue Engineering, Hospital Universiti Kebangsaan Malaysia, Kuala Lumpur

INTRODUCTION:

Post traumatic critical bone defect imposes a significant risk of non-union, limb length discrepancy and functional deficit. Tissue engineering, combining the synthetic bone graft with multipotent mesenchymal stem cells has been shown to have good outcome in animal studies but only few reports and trials in humans. Aim of this study to evaluate the effectiveness of Dual density hydroxyapatite bone scaffold with mesenchymal stem cells in treating critical bone defect in femoral non-unions.

MATERIALS & METHODS:

This is a prospective phase 1 clinical trial study performed in University Kebangsaan Malaysia Medical Centre between September 2017 and September 2018. There were two cases of femoral nonunion following a trauma with a significant critical bone defect. Both were treated with dual density bone scaffold incorporated with autologous mesenchymal stem cell. Radiological and functional outcomes were evaluated at 3 weeks, 6 weeks, 3 months and 6 months after surgery using a modified Association for the study and Application of the method of Ilizarov (ASAMI) classification.

RESULTS:

We found that both patients had excellent radiological and good functional outcomes according to the ASAMI classification. There were no significant inflammations, infection or adverse effect documented throughout the follow up.

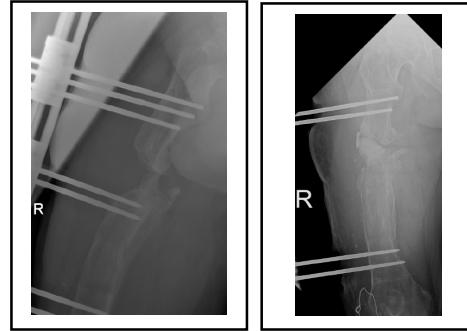


Figure 1: Initial radiograph showing a 2 cm critical bone defect of right femur.

Figure 2: AP radiograph after 6 months showing signs of union over the defect area.

DISCUSSIONS:

Significant reduction of pain score can be attributed by the fact that no autologous bone graft need to be harvested to address the bone defect. With autologous bone grafting, donor site morbidity (persistent pain and hemorrhage) is common, the risk of infection is increased, and the transplanted bone is predisposed to failure. Application of the external fixator provides mechanical stability to the graft with minimal hardware manipulation needed compared to Ilizarov technique which the later has a longer duration of treatment and it is stated to be inconvenient for patients.

CONCLUSION:

Dual density bone scaffold integrated with autologous mesenchymal stem cell (MSC) has good osteoconductive, osteoinductive and osteogenic properties. It is comparable to autologous bone graft with less donor site morbidity. It has positive clinical outcome in treating critical bone defect and can be a favorable option in bone grafting in the future.

REFERENCES: Gallego et al: A pilot study. J Clin Periodontol 42: 1143e1151, 2015