Comparison of the effectiveness of autologous fibrin glue and macroporous biphasic calcium phosphate as carriers in the osteogenesis process with or without mesenchymal stem cells.

Authors: Lee L.-T., Kwan P.-C., Chen Y.-F., Wong Y.-K.

Publication Date: 2008

Abstract:

Background: Facial bone reconstruction has been a challenge for oral and maxillofacial surgeons for a long time. Recently, some studies have reported the use of stem cells in facial reconstruction to achieve osteogenesis. However, to ensure that stem cells remain in the recipient site, a biocompatible carrier is needed to transfer the stem cells. Fibrin glue has been shown to promote hemostasis in wound management and accelerate soft tissue healing, but the role of fibrin glue in bone regeneration remains debatable. The purpose of this study was to compare the effectiveness of autologous fibrin glue and macroporous biphasic calcium phosphate (MBCP) as carriers in the osteogenesis process with/ without mesenchymal stem cells. Methods: Fifteen New Zealand white rabbits were used in this study. Mesenchymal stem cells were harvested from the iliac bone, and autologous fibrin glue was made from peripheral blood. Three cranial defects with a diameter of 6 mm were created over the cranial bone in each rabbit. The 15 animals were separated into 2 groups. The first group contained 12 rabbits. The grafted substances placed over the regions of defect were: (1) stem cells plus autologous fibrin glue; (2) stem cells plus MBCP; (3) defect alone as control. In the second group of 3 rabbits, the cranial defects were grafted with: (1) autologous fibrin glue alone; (2) MBCP alone; (3) defect alone as control. Rabbits were sacrificed at 1, 2 and 3 months post operation. Radiography and histology were used to detect bone formation. Results: Stem cells plus autologous fibrin glue induced more bone formation 2 months post operation and more mature bone was found 3 months post operation compared with the other groups. MBCP with

or without stem cells showed moderate tissue reaction, including giant cell, histiocyte and eosinophil cell accumulation. Conclusion: Using stem cells plus autologous fibrin glue as the carrier may accelerate new bone regeneration.