

The impact of CF-M801 osteoblasts derived from human umbilical cord stroma cells, on bone regeneration in a goat femur partial defect model

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OBJECTIVES: This study aimed to assess whether the transplantation of CF-M801 osteoblasts enhances bone regeneration in a goat femur partial defect model.

METHODS:

Experimental Setup: Adult goats with open femur partial fractures were utilized, involving the removal of a circular bone segment measuring 0.8 cm to create the partial defect.

Osteoblast Preparation: CF-M801 osteoblasts were derived from human umbilical cord stroma cells and were characterized for their osteogenic properties using various markers including alkaline phosphatase activity, alizarin-red staining, and expression of matrix proteins such as type 1 collagen, osteopontin, and osteocalcin.

Treatment Groups: Alginate capsules were produced using 3D printing and transplanted into the bone defects either with CF-M801 osteoblasts or without (control).

Evaluation: Bone regeneration progress was assessed at 13 and 26 weeks after inducing the bone defects.

- Micro-CT and Histology: Micro-CT scans and histological analysis were conducted to evaluate bone formation and scaffold degradation.
- Tissue Staining: Hematoxylin and eosin (H&E) staining and Masson's Trichrome staining were used to visualize tissue characteristics and new bone formation.

RESULTS:

Micro-CT Measurements: The micro-CT measurements did not reveal a significant difference in bone formation between the groups with and without CF-M801 osteoblasts.

Alginate Scaffold Degradation: Microscopic analysis indicated that the group transplanted with CF-M801 osteoblasts significantly enhanced new bone formation between the 13th and 26th weeks post-injury.

CONCLUSION: The study's findings suggest that the transplantation of CF-M801 osteoblasts derived from human umbilical cord stroma cells has the potential to enhance bone regeneration in a goat femur partial defect model. Although micro-CT measurements did not display significant differences, microscopic analysis highlighted the crucial role of CF-M801 osteoblasts in a scaffold degradation and new bone formation. This research underscores the potential of osteoblast-based cell therapy as a strategy to promote bone repair and regeneration.

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