

Tissue engineered bone regeneration for the large osteonecrosis of femoral head in weight-bearing portion: an observational study

Seung-Hoon Baek¹, Shin-Yoon Kim¹, Bum-Jin Shim¹, Hyun-Sook Park², Sunray Lee², Yeon Kyung Lee²
¹Kyungpook National University, College of Medicine, 130, Dongdeok-ro, Jung-gu, Daegu, 41944, Republic of Korea
²Stem Cell Niche Division, CEFO Research Center, Seoul, 03150, Republic of Korea
insideme@paran.com

Disclosures: Each author certifies that he has no commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

INTRODUCTION: Osteonecrosis of the femoral head with large lesion in weight-bearing portion usually progress to arthritis within short period and lead to hip replacement. We report long-term study using tissue engineered bone regeneration for these challenging conditions to preserve the femoral head.

METHODS: Bone marrow was aspirated from iliac crest and mononuclear cells were collected. These cells were expanded ex vivo and differentiated to osteoblast lineage cells using sequential osteogenic media and autologous serum for 2-4 weeks. Porous bead-form scaffolds were made of calcium metaphosphate (CMP) and cells were seeded in a density of million/ml³ into 20 to 30 beads for 1 hour. The necrotic area was curetted and the beads were implanted through core tract in 9 hips of 7 patients who had large lesion (Steinberg IIc in 5 hips and IVc in 4 hips) in weight bearing area (Japanese Investigation Committee C1 in 4 hips, and C2 in 5 hips). The tract was blocked with a CMP rod. The age of the patients ranged from 16 to 37. Associated factors were; steroid in 4 hips, idiopathic in 3 hips, alcoholic in 1 hip, and traumatic in 1 hip. Kerboul combined necrotic angle was more than 200° in all hips (range, 200° to 380°). Minimum follow-up period was ten years (range, 10 to 11 years).

RESULTS SECTION: Two hips with IIc lesion progressed to IVc with dome depression>2mm and were converted to THR. The other 7 hips did not progress to advanced to osteoarthritis radiographically. Follow-up radiographs and MRI showed evidence of partial regeneration of necrotic bone and partial signal change to normal marrow image.

DISCUSSION: Tissue engineered bone regeneration using the bone marrow expanded osteoblast lineage cells ex vivo and CMP scaffold was very promising strategy to preserve of femoral head for osteonecrosis with large lesion in weight-bearing area.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): Clinically, it is considered to be important because it shows the therapeutic effect of stem cells in ONFH.

ACKNOWLEDGEMENTS: This paper was supported by the Ministry of Health & Welfare (Korean Fund for Regenerative Medicine (KFRM) grant, code 22D0801L1 and 22C0604L1)

IMAGES:

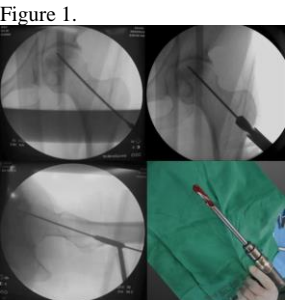


Figure 1.

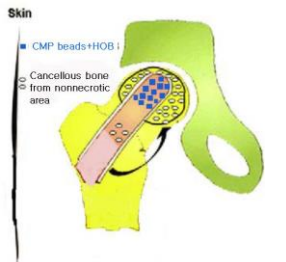


Figure 2.

