

Repair of the Femoral Head Osteochondral Defect Using Free Autologous Costal Cartilage Graft Transplantation

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INTRODUCTION:

Critical osteochondral defects are impossible to be self-cured, and usually lead to osteoarthritis and subsequent total joint arthroplasty in the end. This would be extremely miserable for patients in young age for the potential risk of infections and repeated revisions. Therefore, cartilage repair should be considered first for joint preservation, particularly for young individuals. But up to now, no method available has been accepted generally as effective for manage cartilage defects with large size, especially for femoral head. Costal cartilage is hyaline cartilage and similar to the articular cartilage; hence it can be reliable source of autografts for cartilage repair. Our previous study showed that, the costal cartilage could biologically integrate with the underlying host bone after transplantation, so it would be possible to repair extensive cartilage defects and salvage a joint using costal cartilage grafts. We employed costal cartilage grafts to reconstruct impaired articular surface of femoral head, and performed a 1-year single-arm study and 2 additional years of follow-up.

METHODS:

Twenty patients with critical osteochondral defects were enrolled at a single center. They are less than 40 years old had substantial hip pain and/or dysfunction after nonoperative treatment. The defects were repaired using autologous costal cartilage grafts (ACCG) to restore femoral head congruity after lesion debridement. The primary outcome was the change in Harris hip score (HHS) from baseline to 12 months postoperatively. Secondary outcomes included the EQ VAS, hip joint space width, subchondral integrity on computed tomography scanning, repair tissue status evaluated with the Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) score, and evaluation of cartilage biochemistry by delayed gadolinium-enhanced magnetic resonance imaging of cartilage (dGEMRIC) and T2 mapping.

RESULTS:

All 20 enrolled patients (31.02 ± 7.19 years old, 8 female and 12 male) completed the initial study and the 2 years of additional follow-up. The HHS improved from 61.89 ± 6.47 at baseline to 89.23 ± 2.62 at 12 months and 94.79 ± 2.72 at 36 months. The EQ VAS increased by 17.00 ± 8.77 at 12 months and by 21.70 ± 7.99 at 36 months ($p < 0.001$ for both). Complete integration of the ACCG with the bone was observed by 12 months in all 20 patients. The median MOCART score was 85 at 12 months and 75 at the last follow-up (range, 24 to 38 months). The ACCG demonstrated magnetic resonance properties very similar to hyaline cartilage.

DISCUSSION AND CONCLUSION:

Autologous costal cartilage transplantation may be feasible and reliable reparative method for improving hip function and quality of life for at least 3 years in young patients with large osteochondral defects on femoral head. The biological integration of the autologous costal cartilage graft and recipient femoral head bone bed may contribute to the promising long-term outcomes. This novel method rise hope to reduce the need of artificial joint replacement, especially for the younger patients.

