Viability of Cells from Displaced Fragments of the Elbow Osteochondritis Dissecans: Alternative Source of Autologous Chondrocyte Implantation

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INTRODUCTION: Autologous Cell implantation (ACI) has potential for repair using hyaline cartilage1. However, there remain concerns about ACI because it requires two-stage surgery, has a high cost, and can cause donor site morbidity. We hypothesized that displaced fragments in osteochondritis dissecans (OCD) of the elbow comprise cartilaginous tissues and thus could be a potential cell source for ACI. The purpose of this study was to assess the histological properties of cells from displaced fragments obtained from patients with advanced OCD of the elbow and to examine whether these displaced fragments could be used as a cell source for ACI.

METHODS: Institutional Review Board approval was obtained prior to initiation of the current study. We harvested 6 displaced fragments from 6 patients who underwent osteochondral mosaicplasty for OCD of the elbow. The displaced fragments were examined histologically and digested to obtain chondrocytes. The cells obtained from young patients and skeletally matured cadaveric donor were examined using quantitative reverse transcription polymerase chain reaction analysis to quantify the expression of chondrocyte marker genes, aggrecan, type II collagen, Sox9, and CD44. The cells were cultured in atelocollagen, and the properties of three-dimensional cultured cartilage were evaluated according to Ochi’s method2. To assess the capability for implantation of 3D cultured cartilage obtained from the displaced fragments, their morphological appearance, cell viability, and GAG concentration were examined.

RESULTS: All displaced fragments contained hyaline cartilage tissue. Isolated cells expressed chondrocyte marker genes. We were able to obtain three-dimensional cultured cartilage containing high levels of glycosaminoglycan and type II collagen from all 6 displaced fragments. Expression of type II collagen was found especially in the superficial layer of the cartilage and in the middle and deep layers of the cartilage.

DISCUSSION: The cells obtained from the displaced fragments may be a cell source of autologous chondrocytes implantation. We have demonstrated that displaced fragments from OCD of the elbow have potential for a cell source for generating three-dimensional cultured cartilage. We should consider that the cells obtained from young age may affect the current results. Transformation of chondrocyte phenotype should be observed after implantation, especially young age. The current results indicated that the collected cells from young elbow OCD exhibited the properties of hypertrophic chondrocytes. The major concern related to the use of displaced fragments as a cell source for 3D cultured cartilage is that cells obtained from displaced fragments have higher ALP activity and type X collagen gene expression levels compared with normal cartilage. Although there were several limitations in the current study, we conclude that the chondrocytes obtained from the displaced fragments remained viable and exhibited chondrogenic features.

SIGNIFICANCE: The current results indicate that chondrocytes harvested from the displaced fragments have potential to be a cell source for cell therapy for capitellar OCD.

REFERENCES