Introduction: Popko (Folia Morphol 2003) reported an articular cartilage repair model employing costal cartilage cells and showed that costal cartilage could be used as an alternative for reconstruction of articular cartilage. However, few previous reports have described in detail the differences between articular and costal cartilage at the cellular level. Therefore, the aim of the present study was to compare the features of these tissues under various culture conditions.

Materials and Methods: Costal cartilage cells and articular cartilage cells isolated from Japanese white rabbits were grown in monolayer cultures. Furthermore, three-dimensional culture was performed on the cells immediately after isolation (primary cells), and on each type of cell after monolayer culture (cultured cells) for three weeks in type 1 collagen gel. Comparisons of the proliferation of each cell type under monolayer and three-dimensional culture conditions, and the appearance of types 1, 2, 3, and 10 collagen/aggrecan were carried out using cell proliferation assay, immunostaining, and real-time PCR.

Results: There were no obvious differences between costal cartilage and articular cartilage between each passage of monolayer culture with regard to appearance (see Fig 1), cell proliferation, and expression of types 1, 2, and 3 collagen/aggrecan.

Although expression of type 2 collagen and aggrecan was stronger when primary cells were used for three-dimensional culture (see Fig. 2), there was no difference in this respect between costal cartilage and articular cartilage.

Cultures of primary cells from articular cartilage showed stronger expression of type 10 collagen than those of primary cells from costal cartilage, although the difference was not significant.

Discussion: There was no clear difference between the costal cartilage and those of articular cartilage under monolayer culture conditions. Under three-dimensional culture conditions, although there was a sufficient difference in expression of type10 collagen to allow the two cells types to be distinguished from one another, this difference was not significant statistically. From these results, it is thought that application of costal cartilage for autologous chondrocyte implantation (ACI) would yield similar results.

However, there are few problems to verify in the further study. Although costal cartilage and articular cartilage are both forms of hyaline cartilage, the former is a non-load-bearing cartilage and the latter is a load-bearing cartilage. And more, they show differences in cell form in vivo at the light microscopy level (Fig. 3).