THE USE OF NEOCARTILAGE IMPLANTS TO TREAT OSTEOCHONDRAL DEFECT: MACROSCOPIC AND MICROSCOPIC OBSERVATIONS USING UNDECALCIFIED TISSUE PREPARATION

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ABSTRACT

Osteoarthritis is a condition characterised by gradual loss of articular cartilage within the synovial joints. The earliest sign of degeneration is when the superficial or the outer layer of the cartilage is disrupted. Once cartilage morphological structure collapses, the cartilaginous properties, including extracellular matrix content and collagen type II, are also disturbed. The currently available treatments only resolute the pain instead of treating the underlying problem. Tissue engineering and regenerative medicine have been introduced as an alternative modality in treating this degenerative disorder. This study aimed to evaluate the use of tissue-engineered neocartilage constructs (or implants) for cartilage repair in an animal model. A combination of autologous chondrocytes, poly(lactic-co-glycolic acid) (PLGA) based scaffolds, and chondrogenic-facilitating culture medium was used to form the neocartilage constructs. The constructs were implanted into the osteochondral defect in the knee of the rabbits. The orthotopic implants were harvested at 4-, 8- and 12-week post-implantation. The evaluation includes macroscopic and microscopic observations of tissue structures. The scoring assessment was done using the International Cartilage Repair Society (ICRS) macroscopic evaluation of cartilage repair. For the histology, the constructs were processed using undecalcified tissue processing and stain with H&E. The degree of defect repair achieved more than 50% of the defect depth within 8-week implantation. Complete integration between native tissue and neocartilage implant was observed after 12-week implantation. However, the outer layer of the defect has yet to achieve the entire smooth surface to signify the hyaline cartilage morphology. In this study, the ability for cartilage-to-cartilage and cartilage-to-bone tissues to integrate indicates good healing response for cartilage repair in vivo.

Keywords: articular cartilage, gene transfer, tissue engineering, animal study, PLGA

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