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Potential of Regenerative Medicine in Articular Cartilage Injury

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Introduction:

Successful regeneration of functional and durable articular cartilage is a public health priority. Internationally, knee osteoarthritis alone is expected to be the fourth leading cause of disability in women and the eighth leading cause in men. For those who live long enough, pain and dysfunction resulting from some degree of cartilage injury and degeneration seem a virtual certainty.

Joint cartilage shows a very limited capacity for self-repair. Currently following operative treatments are used;

1) **Micro fracture** , where an awl is use to penetrate the subchondral bone plate in a systematical manner arthroscopically. Though some hyaline like cartilage are formed the major part of repair tissue consists of fibrous cartilage.

2) **Mosaicplasty** ,where cylindrical cartilage grafts from non-affected parts of the joint are obtained and moved into the defect. The procedure requires open surgery. Mosaicplasty raises some concerns First, to what extent do harvesting of cartilage plugs damage the knee. Second, the plugs cannot be made to fit exactly in to the defect so some regeneration of tissue in between plugs has to take place. The tissue generated is likely to be of a fibrous cartilage type.

Role of tissue engineering:

The pivotal work of Brittberg el al (1994) from Sweden opened new avenues in the field of management of articular cartilage injury. They took cartilage from the edge of a knee joint, grew it in culture and returned it to the defect by using a periosteal flap to create watertight chamber into which the chondrocytes were injected. This technique is called autologous chondrocyte implantation (ACI).

A newer development in chondrocyte tissue engineering includes the MACI (matrix induced autologous chondrocyte cell implantation) technique. This method overcomes certain problems encountered in ACI for example harvesting of the periosteum and injection of cells, which may cause sub optimal results. Matricel membranes have been developed which are porcine in origin and have been found to be biodegradable. These are Type III collagen and I and do not produce any host immune response. Preclinical studies in rabbits have shown that

MACI restores hyaline cartilage within 6 months of implantation.

The chondrocyte cell culture and tissue engineering at the international level has progressed beyond the research laboratories and are on the threshold of clinical trials. If a successful procedure for regeneration of cartilage can be developed in India it would have a major impact in helping a millions of patients in our country.