

Mini-Review (Narrative)

Articular Cartilage Repair

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SUMMARY

The articular cartilage repair can be achieved through different ways that is cell based repair, articular cartilage transplant, the use of micro fracture technique, the use of osteochondral autograft transplant, palliative care and the use of cell and scaffold technology. Articular cartilage repair is ineffective in some cases depending on the method which is used in the repair processes. The replacement does not help most of the patients, and this has dramatically resulted in other adverse effects to the clients. The majority of the patients who have adverse symptoms and considerable tear damage of tissues do not heal faster. The surgeons should take advantage of the rapidly growing technology in the field of medicine. This will help them to adopt those technologically based modes of articular cartilage methods which are more effective than those other method. The processes should be conducted with a lot of care as any defect can lead to further damage to the articular cartilage tissues which are very delicate. ■

KEYWORDS Cartilage; Articular joint; Osteoarthritis; Regeneration; Bioengineering

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THE main aim of articular cartilage repair is to ensure that the articular cartilage joint is restored.

The methods do not entirely rebuild the damaged articular cartilage and hence does not give promising results. The leading cause of articular cartilage damage can either be trauma or disease which causes a significant injury to the articular cartilage. The first smooth cushion that lines the end of the bones where they meet at the considerable joint can be affected, and this results into a significant pain and weakness. This is because the body has a minimal capacity to regenerate articular cartilage cells and giving it enough energy to multiply, injuries to the cartilages causes significant and progressive damage to the joint. The articular cartilage lines the ends of the joint surface, and it is made up of several cells called chondrocytes with a thin matrix scaffolding lining called collagen. When the areas of the cartilages are worn out exposing the bone outside the specialized treatment is designed to repair the missing area with the articular cartilage providing new protection for the joint surface. The articular cartilage repair depends on several factors which include the patient's age, patient's activity level, the overall condition of the joint, the size and location of the lesion, the patient ability to participate in rehabilitation activities and finally whether the patient is put in sporting activities. The following are some of how the articular cartilages can be repaired. This process should be carried out in orderly manner without any inconsistencies which may lead to defects and hence resulting into physical challenges to the patients affected.

The use of Cell-based repair; this method usually involves the processes of removing the patients' cartilage cells or the chondrocytes and then growing them in a well-cultured laboratory set up, after this then the cells which have multiplied will be returned to the injured place to ensure that it has been repaired (1). These technologies of cell-based repair have continuously developed over a long period with the growth in technology. The use of cell-based repair is costly as it requires a lot of processes and a state of the well-furnished facility and hence the process is very expensive and costly. This method takes place in stages, and all this stages are usually conducted in vitro environments where the cells can grow and multiply rapidly without any problem or challenge. The cell-based repair is one of the most common types of articular cartilage repairs in the world (2).

The use of articular cartilage transplant; where the patients with more prominent defects and damages which have continuously failed certain types of surgery are allowed to undergo the delicate allograft cartilage transplant. In this method, the cartilage defects are repaired by replacing the damaged tissue with a donated one. This method is always believed to be more effective where other means of articular cartilage repair have failed but over the period's cartilage transplant have proved to be one of the most successful methods of cartilage treatments. This method results in a faster repair of the damaged articular cartilage than most of the plans (3). One of the significant advantages of this method is that it is usually individual cells which are used and hence helping to reduce the cases of genetically acquired diseases and additionally minimizes pain and has a brief recovery period. The use of articular cartilage transplant has advanced over the period, and this has made it one of the commonly used types of cartilage repair methods and hence should be heartily embraced by the scientist (4).

The use of the microfracture technique in the repair of cartilage; this method focuses on ensuring that the body produces new articular cartilage cells as a way to combat the subchondral bone. The microfracture techniques remain one of the most widely used methods of articular cartilage treatment. With this method, the surgeon will always ensure that he or she has created small holes in the underlying subchondral bone in the damaged area (5). The primary role of the holes is to allow clots to form in the injured area and after a long period, the lumps change into cartilage tissue. The blood clot usually takes at most eight weeks to become more fibrous and usually takes around 5 months to become fibrocartilage. A healthy environment of microfracture evolvment and changes is generally required for all this processes to be successful. Researchers are still looking into a more durable and efficient manner to repair the cartilages even though the microfracture have proved to be more effective and very sufficient (6).

The use of osteochondral autograft transplantation surgery; this involves in a situation where plugs and cylinders of bones and stronger articulate cartilage are removed from a very healthy area of the affected patient's knee region that has very little weight (7). The discarded bones are transplanted to the damaged knee of the affected person (8). This method always gives the surgeons a chance to transplant a very strong, durable and mature articular cartilage in the injured area. The re-

placement of these cartilages called the autografts is always used to resurface an area of the knee that lacks a cartilage cover. Individuals who have undergone the transplant are stronger than those who have undergone microfracture (9). The healthy bone and the required cartilage is always taken from the areas which are considered to be of low stress to ensure that the sore joints are not weakened as such that may cause some discomforts to the patients (10). The severity and the size of the damage that the patient has will always determine the extent to which this procedure must be carried out (11). This method is more advantageous since osteochondral tissues are available and very large, and worse damages can easily be repaired. The major worry in using this method is the histocompatibility where there can be a situation of the cells not being compatible with each other resulting in resistance. However, there are advances in tissue preservations and technological advances in the rapidly growing articular cartilage transplant (12).

The use of Palliative care; this is where the orthopedic surgeon recommends the palliative care. The bones from the loose fragments are removed, and the meniscus that might cause a mechanical injury is also removed. It also helps to clean the knee and provides a short-term solution and remedy to the articular cartilage challenges; it revolves around eliminating the degenerative articular cells and fibrous tissues. This method does not always address the issue of articular cartilage repair as the principal objective of the surgery (13). Although this method is still effective, it is always recommended that short-term approaches should be used since such procedures are always very minimally costly and help to reduce pain and improve function. The patients who have undergone the palliative care will still require another similar system at a later date to ensure that the challenge of cartilage lesion is formally treated. The processes provide a strong foundation for new cell development and hence very useful (14).

The use of cell and scaffold technology; this is a technique which was developed recently. It involves the

placement of articular cartilage defect of two or more articular cartilage of synthetic material that ensures that bones and cartilages play the role of the scaffold (15). The affected patient cells will move to the area where the injury has occurred, and this provides that the cells have degenerated faster than it was expected. This method results in treating the damaged articular cartilage in a more efficient and cost-saving way. The stem cells are usually the primary model to facilitate the scaffold technology and hence ensuring that the whole set of cells has been degenerated and adequately affixed (16). The cells can be regenerated synthetically or through scientific models which require a vitro state of the laboratory within its environment. These technologies have significantly made it easier to teach the habit of repairing the articular cartilage without any challenge. The processes of articular cartilage repair procedures have had great success over the periods as the technique is undergoing several advancements. These changes are always very complex and demanding. This is because the cells always take a very long period to mature and fully adapt (17).

Articular cartilage repair is ineffective in some cases depending on the method which is used in the repair processes (18). The replacement does not help most of the patients, and this has dramatically resulted in other adverse effects to the clients. The majority of the patients who have adverse symptoms and considerable tear damage of tissues do not heal faster (19). If the repair period is too short and not well monitored, it leads to stress, causing the processes of repair to fail actively. The surgeons should put into place and take advantage of the rapidly growing technology in the field of medicine. This will help them to adopt those technologically based modes of articular cartilage methods which are more effective than those other methods (20). The processes should be conducted with a lot of care as any defect can lead to further damage to the articular cartilage tissues which are very delicate and requires attention. ■

ARTICLE INFORMATION

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Author Contributions: Carson had full access to all of the data in the study and takes re-

sponsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Carson

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Acquisition, analysis, or interpretation of data: Carson.
Drafting of the manuscript: Carson.
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Review

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