

An Overview of the Application of *Maqasid Al-Shariah* into Cartilage Tissue Engineering

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ABSTRACT

Tissue engineering, being part of regenerative medicine approaches has been researched and applied to treat the articular cartilage diseases. It offers benefit to humankind by improving healthcare economics, better treatment options and quality of life among the osteoarthritic patients. It is felt that this promising field requires Islamic essences to be addressed to its concepts and practices. The paper begins with the discussion of the potential of cartilage tissue engineering in overcoming the harms that may impact the healthcare stakeholders (patients, providers, medical professionals, researchers and healthcare authorities). This will be followed by deliberations based on the *Maqasid al-Shariah* (five higher objectives of Islamic Law), namely, safeguarding of faith, soul, wealth, mind, and offspring. The deliberations illustrate a general idea of cartilage tissue engineering concept and practices in relation to what Islam champions. Islamic Law is comprehensive and incorporates the moral propositions to the medical discipline. It is presented that every legal ruling in Islam has a function to achieve the benefit to human beings or to protect against harm. The application of *Maqasid al-Shariah* can serve as a practical framework in healthcare setting especially cartilage tissue engineering. It is hoped that this paper will open further discourses to facilitate for a decree by the relevant authority pertaining to the experimentation and practice of tissue engineering, particularly cartilage tissue engineering.

KEYWORDS: Osteoarthritis, Cartilage, Tissue Engineering, Islamic Perspective, Maqasid al-Shariah.

INTRODUCTION

Articular cartilage acts as a load-bearer in human synovial joints. Unlike other tissues, it has little capacity to restore itself because of its aneural, avascular and alymphatic natures. Affliction on articular cartilage is irreversible and may lead to osteoarthritis (OA), a complex multifactorial degenerative condition of the joint.

Osteoarthritis

OA can be regarded as a progressive joint disease caused by a failure in joint damage repair. It is one of the main causes of disability in adults.¹ OA has been considered as one of the most commonly diagnosed medical conditions in the United States (US). This disorder has affected millions of people worldwide, and it is estimated that 27 million adults have symptomatic OA in the US alone.² It is anticipated that OA prevalence to be doubled over the next several decades.^{3,4} Despite its high prevalence, there is no available effective treatment

to prevent or slow the disease progression.⁵

OA greatly affect the health-related quality of life among osteoarthritic patients by causing limitation in mobility and higher mortality and morbidity.⁶⁻⁸ Lee, Lee, and Park⁹ say as cited from a study,¹⁰ the muscle weakness in lower limb and limitation in physical activity are due to pain which are common complications in the knee and hip OA. The condition is also associated with old age. With age, the quality of life of elderly people, especially the OA patients, must be enhanced beyond the simple goal of survival.

Currently, therapeutic options for OA include pharmacological and nonpharmacological treatments for symptomatic relief of OA.¹¹ The drug therapy includes simple analgesic, non-steroidal anti-inflammatory drugs (NSAIDs), cyclo-oxygenase-2 (COX-2) inhibitors, glucosamine and diacerein. Alternatively, surgery will be considered if the patient's quality of life and daily activities are significantly affected even after the above mentioned medical therapies have been prescribed. The available surgical interventions include drilling, microfracture, mosaicplasty and autologous chondrocyte implantation (ACI).¹ All the available options may act only as a temporary measure.¹² If those treatments are no longer effective, the patients may have to undergo total joint replacement surgery.

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Cartilage Tissue Engineering

The ideal solution for treating OA by constructing native articular cartilage is still being explored. It can be noted that tissue restoration activities can be traced back since ancient times.¹³ Nowadays, medical practitioners and scientists are given more alternatives to treat the affected articular surface as the restorative techniques, including cell-based therapy and transplant, are being developed. This gives rise to tissue engineering (TE) field whereby the main principle behind this technique is to repair, regenerate and restore the normal functions of human tissues or organs. Increasing trend of research in cartilage TE may give an answer to cure the OA.¹⁴

Cartilage TE researchers are resorting to tissue engineering principles to repair and restore instead of replacing the cartilage with prosthetics. The technology has attracted healthcare stakeholders including osteoarthritic patients, medical service providers, medical professionals, researchers and healthcare authorities. There are three main elements in applying the principle of cartilage TE which are the cell sources, biomaterial scaffolds, and signaling molecules. The combination of these three elements (also known as TE triad) will form the "cell-scaffold" construct. Taking the cells from a patient, the construct will then be implanted back into the damaged area in the same patient's knee. The technique is known as autologous transplantation.

It is felt that this promising field requires Islamic essences to be addressed in its concepts and practices. Since calls for *Shariah* (Islamic Law) compliance in the biomedical application are growing, it would be justified to explore and deliberate on cartilage TE from the Islamic perspective^{15,16} especially within the context of *Maqasid al-Shar'iah* (higher objectives of Islamic Law). *Maqasid al-Shar'iah* leads to the fulfillment of *Maslahah* (benefits) and prevents *Mafsadah* (mischiefs) based on divine revelation (*Qu'ran* and Prophetic tradition). The emphasis will be given on the role of cartilage TE in addressing the harms that affect the healthcare stakeholders. A holistic understanding that underlines the *Maqasid al-Shar'iah* should be presented in relation to these issues.

This paper distances itself from providing an ultimate Islamic decree or legal maxim in the application of cartilage TE in the healthcare setting. Subsequently, the paper instigates a discussion on the application of the *Maqasid al-Shar'iah* into cartilage TE in addressing OA.

A SUMMARY OF MAQASID AL-SHAR'IAH

Islam is a comprehensive way of life and its foundational goals address the whole aspects of individual's life and society, in this world and the Hereafter. A comprehensive understanding of

Maqasid al-Shariah may serve each individual and society in terms of justice, brotherhood and social welfare.¹⁷

From the historical perspective, *Maqasid al-Shariah* was originally introduced in the eighth century by *Imam al-Syafi'e* in his writings *al-Risalah*. This is mentioned by *Ibn Subki* as well as *al-Qarafi* (a *Maliki* jurist in the thirteenth century) in *Nafa'is al-Usul fi Syarh al-Mahsul*.¹⁸ In eleventh century, *al-Juwayni* reconstruct the concept of *Maqasid al-Shariah*. Then, *al-Ghazali* in his writings *Shifa' al-Ghalil* and *al-Mustasfa*, had further discussed and refined the *Maqasid al-Shariah* approach. *Izz al-Din Abd al-Salam* further explored the approach in the thirteenth century. Influenced by *Izz al-Din al-Salam* and *al-Ghazali*, *al-Shatibi* further detailed out the concept of *Maqasid al-Shariah* in *al-Muwafaqat* in the fourteenth century. *al-Juwayni* was said to be the first to classify *Maqasid al-Shariah* into three levels.^{19,20}

The levels are *Dharuriyat* (necessities), *Hajiyat* (needs), and *Tahsiniyat* (luxuries). *Dharuriyat* was considered essential matters for human survival and spiritual wellbeing. The failure to address the *Dharuriyat* would precipitate chaos in the community. The *Dharuriyat* level can be further classified into safeguarding one's faith, soul, wealth, mind, and offspring. This paper will be focusing on the five foundational goals of Islamic Law as introduced by the earlier scholars. *Maqasid al-Shariah* has to be considered as a whole and not in parts in order to reflect the holistic view of *Islam*. It is authors' opinion that *Maqasid al-Shariah* could be utilized to form the practical framework of cartilage TE to safeguard the *Diin*/faith, *Nafs*/soul, *Mal*/wealth, *Aql*/mind, and *Nasl*/offspring.

The Application of Maqasid Al-Shariah In Cartilage The Concept And Practices

The ensuing discussions describe the application of five elements of *Maqasid al-Shariah* on the medical management of OA in relation to the use of TE.

Protection of Faith

OA of knee and hip is one of the leading causes of disability worldwide. It was ranked as the 11th highest contributor to global disability as stated in the Global Burden of Disease study in 2010.^{21,22} OA can significantly reduce the ability for physical activities^{23,24} including those in the religious ritual. Seen from an Islamic perspective, the limitation on a patients' physical functioning, mobility or stamina may significantly affect the way they perform the religious physical rituals such as *Solah* (daily prayers) and *Hajj* (pilgrimage). Taking prayers, for example, *Ruku'* (bow down), *Tashahhud* (sitting between two prostrations), and *Sujud* (prostrations) are used to praise, glorify and humble oneself in front of *Allah*. These are among the vital parts of the five daily prayers which deemed obligatory for every *Muslim*. The daily prayers are the manifestations of a *Muslim's* spiritual wellbeing in

strengthening individual faith and submission to Allah.

Kasule²⁵ states that medical treatment can be utilized to protect the faith by promoting good health and well-being. Cartilage TE has the potential to restore the native cartilage structures and functions of OA patients. The application of the technology may preserve the faith of *Muslim* individual through reinstating his physical rituals. Besides that, *Muslim* medical practitioners and scientists are using their contemplating faculty and skills in order to seek for best treatment and help the others. They are assisting the Muslims to remain steadfast in performing religious obligations to Allah.¹⁵ Applying cartilage TE may instill the moral norms of *Ihsan* (beneficence and benevolence) as *Islam* requires in the process of healing and remedy.²⁶ The clinical application and research of cartilage TE, with good intentions, may serve to protect the faith of Muslims patients.

Protection of Soul

According to World Health Organization (WHO), quality of life (QOL) is “*individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns*”.²⁷ The QOL can be classified into non-health-related quality of life (NHRQL) and health-related quality of life (HRQL). The HRQL constitute general wellbeing including the components that can directly affect individual's physical, psychological and mental health.^{10,28} Not only the pain and disability affect the QOL of patient itself but other family members as well. Inability to do physical activity will further deteriorate the health and lead to other chronic diseases such as diabetes mellitus and hypertension.^{29,30} Thus, the patient's QOL must be addressed properly by healthcare authorities in order to reduce the risk of mortality. OA patients were reported to be concerned about the possible side effects of drugs such as NSAIDs.¹¹ Gastrointestinal bleeding due to the treatment with NSAIDs is not counted as one of the mortality associated with OA.³¹ With that, OA deaths are likely highly underestimated.³² The indirect effect of taking drugs to relieve the pain associated with OA has not been given much attention. One has to note that the drugs may inflict side effects to patients if they neglect the proper drug administration and management. Poor understanding in consuming the drugs may cost patients' life. Applying the cartilage TE to save the patient's knee may prevent the heavy dependence on drugs which may lower the risk of mortality.

Matters of life and death are in the hands of Allah alone. Kasule²⁵ mentioned that even medicine cannot prevent or postpone the death itself. However, medicine can help to preserve the life by ensuring the patient physiological functions are well sustained. Until the time of quietus, cartilage TE may act as a measure to sustain QOL of the

osteoarthritic patients. Cartilage TE has the potential to nullify or reduce the risks caused by drugs prescription by directly treating the side of effect or injury.¹⁵ Successful restoration of cartilage can enhance the QOL of the patients and reduce the mortality and morbidity caused by OA.

Protection of Wealth

In 2012, Chen, Gupte, Akhtar, Smith, and Cobb³³ has mentioned that “*Costs for topical and oral NSAIDs were estimated to be £19.2 million and £25.65 million, respectively. The cost of hip and knee replacements was estimated to exceed £850 million, arthroscopic surgery for osteoarthritis was estimated to be £1.34 million. Indirect costs from OA caused a loss of economic production over £3.2 billion, £43 million was spent on community services and £215 million on social services for osteoarthritis*”. It can be inferred that OA has contributed to the growing financial burden on the healthcare system. One can anticipate that the cost to treat OA will increase in the future. Protection of wealth in *Maqasid al-Shariah* involves both human and material resources. An individual's health is correlated with the community health. Healthy citizens may contribute more to the society in terms of financial growth.²⁵

OA results in large indirect costs to society, mainly impelled by decreased productivity.³⁴ These indirect costs, combined with expenditure in OA management and particularly total joint arthroplasty³⁵ create a huge economic burden.²² A study has shown that musculoskeletal pain and osteoarthritis had affected both female and male workers.¹⁰ This may influence their work performance as they are trying to cope with the pain. Both employee and employer are affected by this medical condition which may impose stress on both parties. Osteoarthritic workers would be having low levels of productivity due to inefficiency caused by pain. Decreased productivity in an organization will lead to low profitability.

If the cartilage TE can be implemented accordingly, it has the chance to offer a better treatment option to the stakeholders. Financial dependency on pharmacological and nonpharmacological treatments for symptomatic relief, and also the surgery can be controlled in long run. Besides that, the authorities' spending on healthcare sectors can be of lesser burden with healthier people in the country. The application of cartilage TE in treating OA has the potential to contribute in preserving nation's economy.

Protection of Mind

OA may cause detrimental effects on quality of life, work participation, weight gain, physical activity, fatigue, sleep, anxiety, and depression.³⁶⁻⁴¹ Osteoarthritic patients are considered to have a peripheral disease. The pain they experience is

accounted by nociceptive damage at the joint level.⁴² This can greatly affect the mind of the osteoarthritic patient considered they are dealing with pain in their daily lives.

A study has shown that OA can be associated with short sleep duration.⁴³ It was suggested that the pain caused by the disease consequently disrupt the sleep patterns of the arthritic patients.⁴⁴ This can further cause great disparity in patient's mental health. Disturbed sleep pattern can affect one's judgment, work performance, mood, and safety.⁴⁵ Chronic pain may result in psychological distress such as anxiety and depression. In the long run, pain puts much stress on the brain and causing cognitive issues like low mood, difficulty with memory or concentration.⁴⁶

Safeguarding the mind by removing stress and restoring intellectual and emotional functions can be done through the application of physical treatment.²⁵ The concept of maintaining the stable state of mind can be applied in cartilage TE by reducing or eliminating the pain inflicted by OA condition.¹⁵ The patients' mental capacity could be restored and preserved since elements associated with anxiety, depression, and stress could be reduced by applying the technology.

Protection of Offspring

The discussion on offspring or lineage in this paper is focusing on the impact of OA on sexual behavior. A study done on the patients waiting for total hip (THR) or knee (TKR) replacement has shown poor scores in HRQL index on sexual activity.²³ This indicates that OA has a direct impact on the intimate relationship between married couples which may influence the lineage of a family. It is stated that there are several ways that arthritis can affect sexual activity⁴⁷:

1. General wellbeing and mood are affected which lead to low sexual drive.
2. Swollen joints may affect self-esteem.
3. Fatigue caused by arthritis can lower the sexual drive.
4. Painful joints make it difficult in certain position.
5. Arthritis may lead to a dry vagina.

In Islam, there are specific and special obligations for Muslims to bear offspring for the continuity of the society. A healthy community is important in building a human civilization that can maintain the values of morality, justice, and freedom.²⁵ OA as one of the musculoskeletal disorders may cause an adverse effect on reproductive capacity to the patient. Physical inability due to severe hip and knee pain, coupled with psychological disturbances associated with OA can affect intimacy between the spouses. Low sexual frequencies may reduce the chances to bear the offspring.¹⁵ Sexual satisfaction may be significantly affecting the spouses which may lead to an affair and unlawful sexual relation. It may disturb the lineage of progeny in a family. It

is hoped that cartilage TE with the potential to repair the cartilage may restore the intimate relationship between husband and wife.

Harm Reduction in Cartilage TE

It can be appreciated that cartilage TE is worth to be explored by Muslims in treating the OA. However, there are technical issues need to be addressed before this biomedical technology can be applied to the patient. To name a few, the issues includes cell harvesting from the patients, safety concerns of the implanted constructs and materials use, and animals utilization in proof of concept study.⁴⁸ Every aspect of cartilage TE are also bound to the moral values involving patients, surgeon, researchers as well as authority. Thus, there is a need to identify the harms and come out with an effective system or framework to eliminate or reduce the harms.

A simple and general risk assessment is not possible in cartilage TE as the purposes, procedures and applications are too variable in each level of TE. Thus, there is a need for a comprehensive review to address all the issues respectively. It is noted that the role of Islamic Law is not to restrict the medical discovery, rather it may work as an approach to identify the medical benefits and meaningful aspects. The approach of *Maqasid al-Shariah* is very important in shaping the healthcare framework in cartilage TE. Thus, it can be conferred that the function of *Maqasid al-Shariah* can be used to guide the scientific directions which in line with Islamic teaching.

CONCLUSION

This paper presents a general idea of cartilage TE concept and practices in relation to what Islam champions. It is presented that every legal ruling in *Islam* has a function to achieve the benefit to human beings or to protect against harm. OA may cause harms in terms of disability, mortality, mental and economic instability, and also affect sexual activity. Cartilage TE, being one of the solutions in treating the OA complements the currently available treatments in managing the disease. It offers benefits if the technology can be conducted in a systematic order. However, there are still scientific and ethical challenges that surround the application of cartilage TE. The application of *Maqasid al-Shariah* in TE can serve as a practical framework to safeguard the faith, soul, wealth, mind, and offspring. It can be concluded that the treatment of OA is considered as *Dharuriyat* as the disease affect directly the stakeholders' well-being. The technology itself is worth to be explored and expanded to cater the OA predicament. It is hoped that this paper will open further discourses to facilitate for a decree by the relevant Islamic authority pertaining to the experimentation and practice of tissue engineering, particularly cartilage TE.

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