



New Hope for Knee Osteoarthritis

– A Novel Concept for the
Treatment of Osteoarthritis
of the Knee

Written by Jian-Xing Yu, Pei-Ru Jiang, Chiu-Hui Huang
Edited by Shaw-Ruey Lyu, Director of the Joint Center
of Dalin Tzu Chi General Hospital

The knee joint, a very intricate part of the human body, allows people to perform various daily activities.

According to medical statistics, the knee joint moves about one million times per year, that is an average of two to three thousand times per day.

The cost of this frequent use of the knee joint is no doubt an acceleration in degeneration.

Treatment typically begins with pain medication for patients diagnosed with knee osteoarthritis.

A knee joint replacement operation is a last resort for the advanced stage of the disease.

After more than a decade of research, the Joint Center of the Dalin Tzu Chi General Hospital has discovered a key cause of knee joint degeneration.

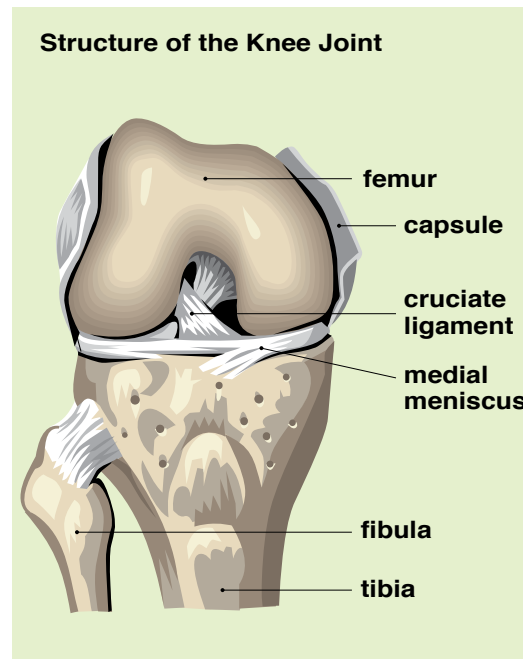
That has led to an innovative way of preventing or even curing osteoarthritis.

With the Knee Health Promotion Option (KHPO) Project, cartilage regeneration is not just a dream.

It has allowed crippled and suffering patients, one by one, to stand up and walk out of the imprisonment of pain and discomfort.

More patients come to the Joint Center of the Dalin Tzu Chi General Hospital on Monday than any other day during the week. They come from different cities, and some even come from other countries. Most of them, if not all, are there because of the same disease – osteoarthritis of the knee.

One day, a 48-year old house wife came to the clinic. Dr. Shaw-Ruey Lyu, Director of the Joint Center, said the patient was embarrassed to tell him that she had visited other clinics before. Dr. Lyu encourages patients to get ‘second opinions’ to protect themselves. By listening to and understanding opinions from different doctors, patients are more likely to decide upon the best treatment. The subject patient has had knee pain for more than three years. The recommendations from different doctors were similar – caring for the knees, taking glucosamine supplements and undergoing hyaluronate sodium injections, and that she would need knee joint replacements when the situation worsens. While some doctors suggested more exercise, others suggested less. She was lost in all sorts of medical suggestions. Moreover, the knee pain remained and was getting worse, that her knees have started showing signs of deformation. She wonders how long she has to suffer before she need her knees replaced. By chance, she heard about the Knee Health Promotion Option (KHPO)



at the Joint Center of the Dalin Tzu Chi General Hospital and looked into whether KHPO could really help her.

Degeneration is a Natural Process?

Osteoarthritis matures over forty to fifty years. Pain and deformation do not occur until the later stage of the illness.

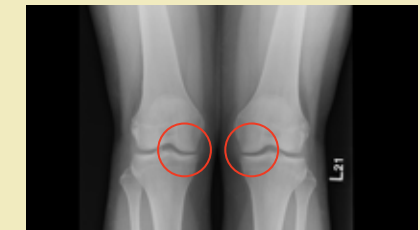
The knee joint is composed of bones, cartilage, and ligaments. The bones include the femur (thighbone that connects to pelvis), tibia (shin bone that connects to ankle), kneecap which support muscle function and fibula that runs parallel to the tibia. The cartilage part includes the menisci, which are two pads of

cartilaginous tissue that serve to decrease friction in the knee joint between the lower leg and the thigh. Ligaments are the tissue that connects bones to other bones; their main function is to maintain the stability of the knee. The knee joint is the largest joint in our body. It supports flexion, extension, and rotational motions that allow humans to do a variety of easy and difficult activities such as walking, running, ballet, or competing in Wimbledon or World cup.

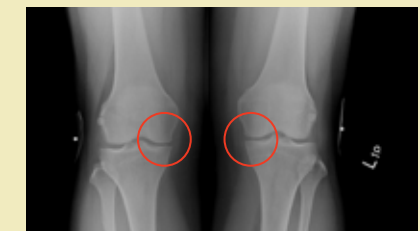
Dalin Tzu Chi Hospital, which mainly serves people in the Yunlin and Chiayi areas, is located in one of the demographically aging areas in Taiwan. Osteoarthritis is a major cause of mobility impairment for the elderly in this area. A study conducted by the center based on physical examinations of 4,478 Chiayi residents who were over sixty years old at the time shows that 18.7% of females and 6.3% of the males had knee osteoarthritis. This is about three times higher compared to the similar demographic populations in the U.S. or Europe.

Currently, once been diagnosed with osteoarthritis of the knee, patients start taking medication and nutritional supplements, hoping to prevent the degeneration of the knee joints. Knee replacement is ususally the last option before the knee was worn out. Continual use of medication with steroid over six months may result in osteoporosis. Furthermore, possible side effects of

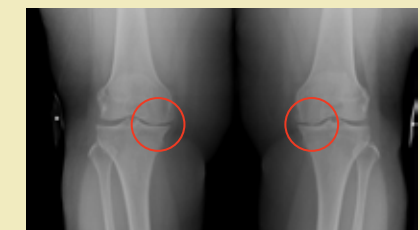
The degeneration of the knee joint is a natural process as aging and can be categorized into four stages:



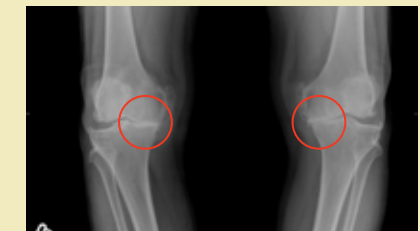
Stage I (20 – 40 years old):
The cartilage may have mild inflammation, slightly rough surface and decrease in elasticity.



Stage II (40 – 50 years old):
The surface of the knee joint becomes rough. Bulges form around the inflamed area. The joint spaces begin to narrow.



Stage III (50 – 60 years old):
The cartilage bulges begin to rupture and the tissue becomes filamentous. Bone spurs develop at the end of bones.



Stage IV (60 years old and up):
The frayed cartilage has almost worn away. The joint space narrows or disappears, and the joint shows severe deformation.

Ms. Yuen-Chie Shieh went from Seattle to the Joint center of Dalin Tzu Chi General Hospital for KHPO treatment. One year after her treatment, she had recovered from surgery very well and was able to play tennis regularly. The picture shows Ms. Shieh, after the surgery, her legs still attached to the drainage tubes.



pain medication includes bleeding of the digestive tract, and kidney function abnormalities; and more importantly, acceleration of the degeneration of the knee joint and unrecoverable physical deterioration.

“Is there no way to stop the degeneration of the knee joint? Is knee replacement surgery inevitable?” In the early course of his clinical research, Dr. Shaw-Ruey Lyu kept asking himself these questions. Not until several years later, did he actually find a solution to these questions.

Cartilage Regeneration Is Not a Miracle - Relief Speakes for Itself

Mrs. Chiang, who runs her lichi farm industriously for years, had been

advised to have a knee replacement surgery. Instead of a knee replacement, she received a simple surgery in the Joint Center of the Dalin Tzu Chi General Hospital and went home a few days after the surgery. The post surgery examination a year later showed that she could walk normally and her knee function had fully recovered without the need for knee replacement.

Good News Travels

Ms. Yuen-Chie Shieh, born in a family of medical doctors, had given up her pharmacist career seventeen years ago and moved to Seattle to enjoy her ‘retirement’ life. Her enthusiasm for playing tennis and other sports possibly damaged both of her knees. In 2000 and 2002, she

received meniscus surgery in the U.S., but the surgeries did not stop her knee from developing into the third stage of knee osteoarthritis. She had continuous severe pain from walking and doing various activities.

Ms. Pei-Feng Tsai, a Tzu Chi volunteer, introduced Yuen-Chie to Dr. Shaw-Ruey Lyu’s online blog. This online visit led her to believe that she had found a true treasure. She carefully studied the KHPO offered by the Joint Center and felt that it could be a good treatment plan for her on-going knee problems. With help from both Ms. Tsai and Ms. Su-Mei Liu, a Joint Center’s staff, Dr. Lyu reviewed Yuen-Chie’s MRI and suggested arthroscopy on both knees at the center. After thorough consideration, Yuen-Chie gave up the health insurance-covered surgery in the U.S. and decided to receive the treatment from Dalin Tzu Chi General Hospital.

Receiving spinal anesthesia allowed Yuen-Chie to stay consciously during the surgery, and was able to observe the entire surgery through a TV monitor. Dr. Lyu was explaining the surgical procedure to her saying, “this is your cartilage,” and carefully cleaning up the cartilage debris in the knee joint.

Less than 24 hours after the surgery, Yuen-Chie said, “I can walk again!” Even though her knees were still wrapped tightly and with blood drainage tubes

attached, Yuen-Chie was able to get off bed and walk around the room.

“You’d better stay away from intensive activities for one year,” Dr. Lyu advised her with great concern.

The Discovery of Medial Plica – Reversing the Degeneration of the Knee Joint

During a knee arthroscopic surgery back in 1995, Dr. Lyu probed into a “mysterious” lesion that lies inside the knee joint. The National Chung Chen University’s research team confirmed Dr. Lyu’s exciting initial finding. “We found a tissue that exists in the inner lining of every degenerated knee joint – medial plica,” Dr. Lyu said, “the existence of this folded tissue is like the existence of the appendix - there is no specific functionality. However, if there is any problem with the medial plica, it could become a “mysterious killer” threatening the health of our knee.

Medial plica is an easily deformed and pleated-looking soft tissue located inside the knee joint. This tissue is as soft as young luffa fruit (sponge cucumber) originally. However, aging and traumatic force can lead to plica fibrosis and slowly roughen the medial plica to a scouring pad which can cause further damage to the cartilage. In damaged knees or knees required to bend, squat or climb

About the Knee Health Promotion Option (KHPO)

With more than ten years of clinical experience and research, the Joint Center of the Dalin Tzu Chi General Hospital has discovered the causative factor of the osteoarthritis of the knee. At the earlier stage of the degeneration, the Arthroscopic Cartilage Regeneration Facilitating Procedure can reverse the degeneration by removing the causative factors and recreating a healthy environment for the knee joint. And depending on the severity of the degeneration, appropriate post-operative modalities can be used to stimulate cartilage regeneration to further reverse the "natural course" of the degeneration of the knee joint.



Treatment Procedure

- * Thorough evaluation, staging of the degenerative knee and patient education prior to surgery.
- * Arthroscopic cartilage regeneration facilitating procedure (ACRFP)
- * Post-operative modalities to stimulate cartilage regeneration

The hidden lesion— medial plica in the knee joint



Perform arthroscopic procedure to remove the filamentous tissue



Tissues around the area of medial plica after clean up



The Treatment Outcomes

Up to the present, there were 500 patients seeking KHPO treatment at the center every year, and we have received numerous positive feedback. Ongoing research is expected to further increase the rate of surgical success.



upstairs on a regular basis, the repeated rubbing motions between fibrotic plica and cartilage can irritate and harden the medial plica. As the hardened medial plica continuously rubs against the cartilage, pieces of the cartilage are chipped away from the bones. This debris may float around the knee joint and cause irregular rubbing when bending. That is precisely the cause of the deterioration of knees as the debris falls into the weight bearing part of the knee joint. Dr. Lyu points out, "A similar situation is when dust gets into your eyes. The constant abrasion can cause necrosis of cartilage and the toxins generated from the necrosis can further inflame the knee joint."

The solution to problems caused by the medial plica lies in the Arthroscopic Cartilage Regeneration Facilitating Procedure (ACRFP) which was introduced by Dr. Lyu. The ACRFP cleans up the inside of knee joint arthroscopically. The earlier the patients receive the treatment, the better their chance of regenerating the cartilage.

Three Surgical Treatment Options - Arthroscopy is the First Priority

There are three main surgical treatment options for osteoarthritis of the knee: arthroscopic surgery, osteotomy, and arthroplasty. The medical devices for arthroscopic

surgery include the arthroscope and an electric cutting instrument. The surgeon starts by performing three half-centimeter incisions around the knee joint. The hollow arthroscopic sheath is inserted into the joint through one of the cuts and a syringe is attached into the sheath. The syringe allows the surgeon to inject saline into the knee joint to expand the narrowed joint space and facilitate the surgery. Next, a fluid-filling instrument is inserted into the joint through the second incision. It is used to flush out small loose pieces in the knee joint during the procedure. Then, the arthroscope is inserted into the hollow sheath and attached to a light source. The surgeon can clearly see everything inside the knee joint through a monitor. Finally the electric cutting instrument is inserted into the third incision to remove the medial plica and the adjacent fibrotic capsule. Depending on the severity of the inflammation of the joint capsule, additional work is performed to release abnormal pressure of the knee joint. The incisions from arthroscopic surgery will usually heal within a week. Along with adequate therapies, the damaged cartilage will recover gradually.

Sometimes when the joint is severely deformed but knee replacement is not the proper solution such as those who need to do heavy lifting

The Arthroscopic Surgery for the Osteoarthritis of the Knee

● The Components and the Operation of the Arthroscope

The arthroscope used in the Joint Center is a precise digital optical system, which consists of tiny lens like a pencil-size metallic tube, a TV screen and a video camera that can capture pictures and record videos. It enables doctors to look at the knee joint in greater detail and give proper diagnoses on pathological change in the joint. In addition, it is also able to remove any foreign bodies residing inside the knee joint or any floating cartilage or bone spurs. Furthermore, it can reshape or patch cartilage, or free any adhesion in the joint and release pressure from the inflamed tissue of the knee joint.



During the course of the surgery, the doctor can operate and explain the procedure at the same time. The patient can observe the entire arthroscopic procedure on the TV monitor. The accuracy of the diagnosis is almost 100%.

● Selection of Anesthesia

The decision for spinal or general anesthesia depends on many factors such as the patient's wishes, the patient's health condition, estimated surgical time, and the preferences between the surgeon and anesthesiologist.

● The Advantages of the Arthroscopic Surgery

1. Each incision is as small as 0.5 centimeter.
2. Less damage to the tissue.
3. Short hospitalization; usually 3 to 4 days.
4. On the same day as the surgery, after recovery from anesthesia and with the consent from the doctor, the patient can start walking with help from nurses or family members.
5. Lower risk of complications.

afterward. Osteotomy is a better option. Osteotomy is a surgery in which the surgeon removes a wedge of bone near the damaged joint in order to correct the patient's posture or bone alignment. For example, in open osteotomy for osteoarthritis of the bowing knee, the surgeon cuts the bone from the inner side of the tibia and adjusts the alignment by opening the cut to the correct angle. Then the surgeon places a wedge of the patient's bone or artificial bone into the opening to ensure a perfect alignment to the tibia. Finally, the cut bones are held together by plate and screws. The wedge of bone from one's body or artificial bone will eventually fill up the tibia and patients can regain their normal knee function.

If the knee degeneration is at its final stage, the arthroplasty procedure is recommended. Following the knee replacement surgery, the patient will no longer experience knee pain and stiffness. Eventually, the knee's appearance will be improved and the ability to perform normal activities can be resumed.

The Blog Reaches the World - Patients Share Feedback

On Dr. Lyu's blog, Mr. Huang, one of Dr. Lyu's patients in his seventies, generously shared his experience with everyone. He hopes that other patients

with similar problems will have the same chance to experience the joy of being free from knee pain.

Mr. Huang wrote, "I suffered from the knee pain for almost fifty years. I think it might be due to 'not fully recovering from' past sport injuries and scoliosis. As a result, there was uneven pressure on my legs. Around 2005, I started experiencing intense pain in my right knee. When I tried to stand up after sitting for a long period, I could not walk. Sometimes when I was crossing the street, I felt that I had to stop in the middle of the street because of sudden pain. Stranded in the middle of the street, not only was I not able to move, but I was also placed in a very dangerous situation. I had received therapies from both Chinese and Western doctors, but my condition never improved. I still had knee pain every two to three days. In the end, the bone and joint specialist from a major hospital proclaimed that I was at the forth stage of the degeneration from knee osteoarthritis, and that I needed to have a knee replacement procedure. But I didn't want to accept his treatment plan."

"By chance, I heard the lecture given by Dr. Lyu about the KHPO project. I had a hunch that KHPO might be suitable for me. After serious consideration, I decided to go back to Taiwan for the KPHO treatment. The surgery only required four

small incisions around the knee joint. I could see Dr. Lyu use several mini tools like 'excavator', 'lawnmower', 'hammer', and 'vacuum cleaner' interchangeably. After 43 minutes, the 'stalactite' like obstacles were all cleaned out. During the two-day hospital stay, Dr. Lyu and the nurses took good care of me and gave me many useful tips. After I was discharged from the hospital, I followed their advice and continued my physical therapies. The follow-up on the 10th day showed I had a good recovery. After about four months, I went back to the center for hyaluronic acid injection. The injections are supposed to help my knees heal better and to maintain the health of the knees."

"One year has passed since my surgery. For the past year, I have continued to do muscle training myself. I was pleasantly surprised that the soreness and weakness never came back again. Now I play tennis twice a week, and each game lasts about two hours. I also don't have any problems with other daily activities such as gardening, walking and strolling. The only residual problem is that I can not walk up and down the stairs quickly. However, I think I have regained 95% of the knees' functionalities. Dr. Lyu's surgery has saved me from my fifty years of knee pain and my recent three years of soreness and weakness of my knees."

The Knee Joint Clean Up - the Regeneration of Cartilage

The knee joint moves about one million times a year. Medial plica works like "constant dripping water wearing away the stone" to continuously erode and decompose cartilage, and gradually cause the knee joints to lose their function.

As a person grows older, the medial plica changes from thin and translucent in the twenties, to fibrosis in the forties, and to deterioration and inflammation in the fifties. The research of Dr. Lyu's reveals that knee degeneration is positively correlated to the severity of the gross pathologic changes of the medial plica (from smoothness to fibrosis to degeneration) and the patient's age. To Dr. Lyu, this discovery is like finding the last piece of a puzzle that he had tried to solve for many years. Dr. Lyu is eager to share this discovery, not only with the medical community, but also with his patients and the general public. With that intention in mind, this is how KHPO was born – an arthroscopy procedure to reshape the health of the knee joint and to stimulate the regeneration of the cartilage.

Dr. Lyu says this new technique uses an arthroscope to enter the knee joint and an electronic cutting instrument to remove medial plica and the adjacent fibrotic capsule in order

to release abnormal pressure of the knee joint. Then he uses delicate hand instruments to adjust the tightness of the soft tissue around the cartilage. As Dr. Lyu points out, spinal anesthesia is more comfortable for patients instead of general anesthesia. The surgery only requires the patients to stay in the hospital for one night. The center currently performs about fifty surgeries every month and each knee joint takes less than twenty minutes. According to the Dalin Tzu Chi hospital's clinical results, the success rate for Stage I Osteoarthritis is over 90%, for Stage II it is 80%-90%, for Stage III its 60%-75%, and for the most severe Stage IV, the success rate can be up to 50%.

Symptoms such as knee pain, or knee

stiffness before getting up in the morning, or strange noises out of the knee joint, may indicate the degeneration in the knee joint. Further, if the knee starts swelling or showing signs of effusion, this indicates the knee degeneration has progressed into the active inflammation stage and should be treated by a knee specialist to stop the knee degeneration. It is too late to seek treatment if any deformation has already occurred. Dr. Lyu reminds us that everyone should start actively taking care of his/her knee joints. Do not wait till the degeneration of the knee joint becomes irreversible. It's possible to seek proper treatment such as KHPO to stop the degeneration process in time and regain a healthy life with normal mobility. 🌱



Dalin Tzu Chi General Hospital provides international medical services in four specialty centers, including Cardiovascular Center, Joint Center, Center for Reproductive Medicine, and Center for Preventive Medicine. The picture shows the chief of the Joint Center, Dr. Shaw-Ruey Lyu, discussing the diagnosis and the treatment options with an American patient.