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Dear Readers:

As an orthopaedic surgeon and team physician for several area schools, fall means time for my injury prevention reminder. One of the best things everyone should do is to always warm up and stretch sufficiently before an activity, including sports practices and games, chores at home and even your job. Through my nonprofit foundation, the Orthopaedic Surgery & Sports Medicine Teaching & Research Foundation (OTRF), we develop strength and conditioning programs that are sport and task specific. Some of the programs available are featured on page 10 in this issue of **Active Bones.** You also can download them from our website at http://www.otrfund.org/sports-performance-programs/.

Although injury prevention always should be on your mental checklist before doing any activity, that's not to say an injury won't happen. It is traumatic enough to get injured, but to sustain a re-injury can be devastating. Could it have been prevented? Did the athlete return to a sport too soon? These are questions physicians face daily. There really is no one standard answer, which is why I developed with assistance from my OTRF sports performance team, the functional capacity evaluations (FCE) to test if athletes are ready to return to sport following anterior cruciate ligament (ACL) knee surgery or Bankart surgery for shoulder dislocations. You'll find an overview of our return to sport test for the Bankart shoulder surgery exam on page six.

Despite successful surgery cartilage repair, research continues to show that injuries many never fully recover even with evaluation tools like the FCEs. Consequently, return to previous level of play is highly unlikely. On page two, we delve into the latest research on return to play after knee cartilage surgery and once again the clear message is we need to protect our cartilage and manage rehabilitation expectations.

Other articles I think you'll find of interest are why some surgical recoveries are more challenging than others even though it is the same injury and same surgical procedure, and in *Research Roundup*, how taking the stairs is all you need if you don't have time to exercise.

Thank you for reading Active Bones.

Steven Chudik, MD President OTRF Orthopaedic Surgeon and Sports Medicine Physician





Orthopaedic Surgery & Sports Medicine Teaching & Research Foundation

Research: Low rate of return to pre-injury sport level following knee cartilage surgery

by Kurt Gengenbacher, PT, DPT. OCS, SCS



Recreational and competitive sports can be a large part of our life. When an athlete is injured, it can take a toll on him or her both physically and mentally—especially the big looming questions, "When can I return to my sport?" and "Will I be able play at the same level I did before my injury?" Because no two athletes or injuries are alike, there never has been one definitive answer. However, recent research helps provide us with more insight to help answer those questions.

For ten years, Italian orthopaedic researchers evaluated the clinical outcomes of athletes between the ages of 16 and 29 who underwent knee cartilage repair surgery. The purpose was to study the rate and level of their return to sport. They found that one year after cartilage repair individuals had improved activity levels, but not their peak function until about two to three years post-surgery. These findings are surprising because physicians and physical therapists felt that after orthopaedic repair surgery it took almost 12 months to increase range of motion, strength, balance and endurance, and to fully compete again in sports. Moreover, the athletes in the study never reached their pre-injury level. On a scale of zero to 10, athletes before injury and surgery started around a 9.1 rating. Two to three years after surgery most were at a 7.9 rating.

So, what does this mean for an injured athlete?

With regard to knee cartilage injury repair, athletes improve but may not reach their full functional recovery until two to three years following surgery. Therefore, the healthcare team and athlete must adjust their expectations and continue the rehabilitation much longer than we once anticipated to achieve the highest level of return. Additionally, despite patience and great effort, athletes must be aware that cartilage repair surgery is limited in its ability to return athletes to their pre-injury level of activity.

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Why is my knee surgery more challenging than others?

by Sarah Swientek, ATC and Brecken Sigg, ATC

Arthroscopic knee surgery is a minimally invasive procedure that can be performed with intravenous (IV) sedation and local anesthetic on an outpatient basis (you go home after surgery). Recovery can be quick with return to full activities in a matter of a couple weeks versus several months. Even though arthroscopic knee surgery has become pretty routine, not all knees are the same and neither is the recovery.



Arthritis

One significant factor affecting recovery is if the patient has preexisting degenerative changes, in other words, arthritis. Arthritis is the structural wearing away of the protective cartilage surface covering the ends of our bones at the joint. When functioning appropriately, this cartilage surface allows smooth and painless joint motion, as well as a protective cushion for the bone surface. As knee cartilage begins to wear and fail over time, or after an injury, the ability of the joint to bear weight and withstand prolonged weightbearing forces becomes compromised. Additionally, the knee has two C-shaped menisci which are fibrocartilaginous structures that help distribute forces and provide cushion in the knee. They wear and tear over time as well.

Patients undergoing a routine arthroscopic knee surgery with a relatively healthy joint surface usually experience an uncomplicated

and short recovery and quick return to weight-bearing activities. Conversely, recovery takes longer for the knee with preexisting arthritis and structural damage to the cartilage surface and/or significant injury and loss of menisci. This is because the weightbearing ability of the knee joint is compromised and the patient is unable to tolerate prolonged standing or walking unless there is a gradual resumption of those simple activities for up to six to 12 weeks following surgery.

If a patient with a compromised joint surface resumes activities too quickly following surgery, forces across the joint surfaces are significantly higher than before and can overload the cartilage and the subchondral bone behind the cartilage. Even everyday walking and standing can overload the subchondral bone and cartilage to the point of fracture and aggressive wear of the cartilage surface producing knee pain and swelling. This can result in rapid deterioration of the knee joint surface and progressive arthritis, and even the need for knee arthroplasty (replacement).

Alternatively, if the patient rehabs appropriately on a bike and with strengthening exercises

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Knee surgery not the same for all

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according to Dr. Chudik's post-operative protocol, while minimizing prolonged standing and walking for up to six to 12 weeks, many of these knees can adapt over time and recover.

Lifestyle change is important

Additionally, most patients who undergo arthroscopic knee surgery with some compromise to the weightbearing surface of their knee joint should consider some important lifestyle changes to best preserve their knee function for the long term. Finding creative ways to be active with a decrease in force on their knees is important. Trying to achieve an appropriate body weight is extremely helpful as small amounts of weight loss can reduce the joint compressive forces by several fold during common, everyday activities. By keeping your weight down and losing just five to ten pounds you can decrease the force across your knees by 50 to 100 pounds with every step. Weight loss can greatly decrease pain and symptoms of arthritis and hopefully slow its progression and need for surgery.

Regular exercise that is careful to avoid repetitive weightbearing stress on the knee also is important. Light strengthening and flexibility exercises for the knee will optimize strength, motion and function of the knee and minimize symptoms. To stay healthy and control weight, cardiovascular activities that minimize weightbearing forces on the knee are best and include



Arthroscopic photo of a healthy knee with a normal meniscus and cartilage joint surface.



Arthroscopic photo of a knee with significant cartilage wear and degenerative medial meniscus.

biking, swimming, water aerobics and fluid running. Unfortunately, treadmills, elliptical, running and even regular prolonged walking may not be the best choice and provoke symptoms and contribute to the deterioration of the knee.

Arthroscopic knee surgery combined with an individualized postoperative program that includes an appropriately gradual return to weightbearing activities along with some lifestyle modifications is often necessary to prevent or at least delay the onset of symptomatic arthritis and the need for joint replacement surgery.

Blood flow restriction therapy suddenly getting a lot of attention

by Brandon Postel, PT, DPT, OCS

The application of Blood Flow Restriction (BFR) training is gaining traction among physical therapists for its ability to improve strength gains and aid in rehabilitation and recovery when used with more traditional treatment for a range of orthopaedic conditions. BFR has been found to be helpful in cases with weight bearing restrictions, or when patients with lower back pain need to gain functional strength without lifting more considerable weight. It is not intended for use to treat joint pain.

BFR training uses a tourniquet to briefly and intermittently restrict blood flow to muscles during exercises to stimulate



muscle growth (hypertrophy) and strength response with significantly lighter weights than are typically required to obtain these gains.

The concept of BFR during exercises originated in Japan in the late 1960's by Yoshiaki Sato. It was called KAATSU training and resulted in muscle hypertrophy (growth in size) and increased strength. As this form of therapy caught on, exercising with occlusion bands became popular in body building to "hack" the body into gaining bigger and stronger muscles. Early clinical applications also started in geriatric populations to address age-related cardiovascular changes and muscle atrophy (loss in muscle size). Several key studies by Abe et al, found that BFR helped increase skeletal muscle mass and functional ability in a group of 60- to 78-year-olds while walking on a treadmill five days a week for six weeks as compared to a control group.

Before incorporating BFR into your exercise program, always consult with your physician to make sure it is appropriate for your specific diagnosis and condition. The physical therapist also may contact your physician to determine if you are a BFR candidate and the appropriateness of the intervention, as well as discuss the amount of occlusion to use since it is highly individualized and is regulated by a certified physical therapist to ensure safety. Additionally, the physical therapist will perform a review of your pertinent medical history and inquire about any specific considerations pertaining to the diagnosis.

To use BFR training, the physical therapist will place a tourniquet and sleeve on the affected arm (upper biceps) or leg (upper thigh) during exercises. Exercises may be performed on a table with light weights, or with functional tasks (squat, deadlift, shoulder press) for only short durations of time and with rest breaks. Adverse side effects are rare, but your physical therapist will be able to help monitor your response to treatment. The most common side effects after BFR training are residual swelling in the limb, muscle fatigue and mild soreness. These usually resolve in 24 hours, which is a typical side effect of traditional strength training.

Performed improperly by inexperienced individuals, BFR can result in tissue injury and tissue deat h. Dr. Chudik does not advocate for BFR but understands the importance of providing the information so patients understand the treatment and its risks. Dr. Chudik prefers to avoid inducing muscle and tissue ischemia. Ischemia (lack of appropriate blood flow to skin, muscle and nerve tissue) can cause severe complications and permanent injury to the limb.

Return to sport test now available following shoulder dislocation surgery

by James Wolf, PT, DPT, OCS

Shoulder dislocations are common injuries resulting from contact sports. Most shoulder dislocations are anterior (moving forward out of the socket). When a dislocation occurs, the soft tissue that stabilizes the shoulder can be torn and the bone that forms the glenoid (socket) also can be fractured resulting in a bony Bankart lesion. The mechanism for injury is frequently diving or sliding head first with the arm overhead. Occasionally this same injury can occur with blocking in



Left, an X-ray of a patient with a bony Bankart facture of the glenoid (socket), secondary to shoulder dislocation. Three-D scan of the same patient, right, more clearly recreates the fracture.

volleyball or basketball. The shoulder can "pop" back in on its own right away, or you might need to have a doctor manually move it back into position (reduction). Regardless of how the injury happens or if it reduces on its own, you need to seek medical attention for a proper evaluation and diagnosis.

Once you have dislocated your shoulder, you are at much higher risk to dislocate it again. People with frequent shoulder dislocations are said to have an unstable shoulder. They can become apprehensive about certain activities due to fear of recurrence. These injuries, or even apprehension of re-injury, can lead to difficulties in sports participation or lifting and reaching tasks at home. Multiple dislocations can lead to increased risk of severe joint injury, which may require a more complex surgery and increases the risk for post-traumatic arthritis.

Risk of a second, or subsequent shoulder dislocation is dependent on age and activities. If your first dislocation happens after age 40, you don't play contact sports and you don't do much overhead throwing, then your risk of re-dislocation is five to 10 percent. However, if you are a young athlete under age 30 who participates in contact or overhead throwing sports, then your risk of a second dislocation is much higher—near 100 percent. Additionally, every subsequent dislocation is associated with further injury to the labrum, cartilage and bone of the shoulder joint.

Given the high rates of re-injury after a first dislocation, and the increased risk for poor outcomes with reoccurrence, the current standard of practice is to recommend surgery for a young athlete after

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a first time dislocation. Typically, this would be a surgical procedure called a Bankart repair. The goal of surgery is to repair the damaged structures and stabilize the shoulder to prevent further instability or dislocations. This may involve labrum (Bankart) repair, capsular ligament repair, or glenoid bone fracture repair.

Dr. Chudik performs arthroscopic surgery using a camera that allows him to view the shoulder through small incisions and repair the labrum, capsular ligaments or glenoid fracture. Dr. Chudik reattaches the torn labrum, capsular ligaments or the bony fractured fragments by placing absorbable anchors with sutures in the glenoid, passing the sutures connected to the anchors through the fragment and pulling it back into proper alignment. He then ties the sutures to repair the injured structures. In cases with a larger fracture, it may be necessary to stabilize the fracture using screws to restore the glenoid socket.



Like any surgery, the road to full recovery after a Bankart repair is not quick. Following surgery, patients are in a sling for six weeks and continue physical therapy and training for four to six months. The risk of an additional dislocation after a Bankart repair ranges from four to 19 percent. While this is certainly much better than almost 100 percent risk without surgery, we are striving to do even better than that.

One key to reducing this risk is to ensure full recovery of shoulder strength, range of motion, and dynamic stability before an athlete returns to sport. Building on the success of the ACL functional capacity evaluation (FCE), Dr. Chudik and the OTRF sports performance team developed a similar test for patients who had arthroscopic Bankart repair surgery.

According to Dr. Chudik, although there have been many technical advances in arthroscopic Bankart surgical repair and post-operative rehabilitation, there still remains a significant re-injury rate which most surgeons consider to be related to the strength of the repaired tissues. However from personal observation and experience, Dr. Chudik has seen increased performance and possibly joint awareness following a more advanced, progressive balance and stability training program.

With this in mind, the OTRF team felt it was necessary to create an advanced shoulder dynamic stability training program and shoulder FCE. This would help ensure the athlete regained better

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FCE shoulder exam

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strength, stability and position sense, and had the best opportunity to pass the FCE and also return without re-injury.

"We've been using the training program and FCE since the spring of 2017 and it definitely helps us identify specific deficits and weaknesses that may remain," Dr. Chudik explained. "It works like the ACL test and it provides us with simple 'PASS' or 'FAIL' grade to let us know if the athlete is ready to return to sport."



Similar to the ACL functional capacity evaluation, Dr. Chudik and the OTRF Sports Performance Team are investigating this new test and hope to determine whether or not it helps reduce the re-injury rate.

Additionally, OTRF created a return to sport training *Upper Extremity Advanced Strength and Conditioning Program* designed for the final stages of rehabilitation after a shoulder injury. It is for athletes who have good strength and range of motion, but still need a little more work on dynamic shoulder stability. For information on the return to sport FCE testing, please contact Dr. Chudik's office at 630-324-0402 to schedule an

appointment or go online to http://www.stevenchudikmd.com/schedule-online/.

Low rate of return to sport

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Dr. Chudik and his OTRF sports performance team have developed return to play tools/evaluations to provide objective measures to determine when return to sport is safe following arthroscopic and open knee or shoulder surgery. This provides an objective measure for both the athlete and Dr. Chudik to know when it safe to return and also what else needs to be worked on if the athlete fails to pass the exam.



Research Roundup



Put your phone down if you want a successful workout

Multi-tasking may help you get ahead at work, but not at the gym. In fact, a study published in the *Journal of Performance Enhancement and Health* revealed that talking or texting on a cell phone can affect your stability and lead to falls and injuries.

According to Dr. Steven Chudik, president and founder of the Orthopaedic Surgery & Sports Medicine Teaching & Research Foundation (OTRF), multi-tasking is not always productive and can result in bodily harm. "The study revealed texting and talking negatively impacted balance by 45 percent, while talking on the phone decreased it by 19 percent," he explained. "It can distract us to the extent that it affects even our postural

stability which can place people at risk for injury from stumbling, losing their balance and falling in situations that might not otherwise create a problem," he added.

The venue also doesn't matter. Dr. Chudik said people who answer the phone while walking on a treadmill or even on a sandy beach are more likely to stumble, fall and twist an ankle or knee. "Clearly, the takeaway message is that people should be careful to avoid talking or texting on their cell phones while performing other tasks, especially walking, exercising and driving," he cautioned.

No time to exercise-take the stairs

A study in *Medicine & Science in Sports & Exercise* details stair-climbing research on sedentary, but otherwise healthy women. Researchers found that brief, intense stair climbing is a practical, time-efficient strategy to improve cardiorespiratory fitness.

The study tested the effect of two different stair-climbing exercise routines that included warm-up, cool down and recovery periods for a total investment of 10 minutes, three times a week. The first routine involved three, 20-second bouts of continuous climbing in an "all-out" manner. In the second test, participants vigorously climbed up and down one flight of stairs in one-minute intervals. Researchers found both routines produced major benefits for heart health.



According to Dr. Steven Chudik, president and founder of the Orthopaedic Surgery & Sports Medicine Teaching & Research Foundation (OTRF), the underlying science behind these results is what we find with interval sprint training which involves short bursts of vigorous exercise with short resting periods.

No stairs at work or home? Dr. Chudik recommends stationary standing or walking lunges which are similar in technique and target the same muscle groups as climbing stairs. He also suggests that before starting any new exercise program to first consult your physician, regardless of age and particularly if you have heart, joint or balance concerns.

Orthopaedic Surgery & Sports Medicine Teaching & Research Foundation

Play, participate at peak performance with sport-specific OTRF programs

Through the Orthopaedic Surgery & Sports Medicine Teaching & Research Foundation (OTRF), Dr. Steven Chudik and his Health Performance Team provide reliable and proven training information to help athletes of all ages and abilities compete and perform at their best—no matter if it is a state athletic championship or a weekly golf outing with friends. One of the most popular resources is OTRF's sports performance programs. Research-based, these programs incorporate appropriate exercises, weights and stretching into weekly training schedules to maintain strength and help minimize injuries.

The health performance programs are electronically distributed with the OTRF Active Bones E-newsletter. To automatically receive new programs, email OTRF and request to be added to the Active Bones mailing list. Sports performance programs previously developed by OTRF are available as PDF downloads.

To download any of the free sports injury programs from Dr. Chudik and OTRF, visit the OTRF website, **otrfund.org** and click on the sports performance tab. Or, email **contactus@chudikmd.com** for a printed version. Make sure to include your mailing address.





Orthopaedic Surgery and Sports Medicine Teaching and Research Foundation helps people stay fit and healthy

Dr. Steven Chudik, orthopaedic surgeon and sports medicine physician with the Steven Chudik Shoulder, Knee & Sports Medicine Injury Clinic, founded the Orthopaedic Surgery and Sports Medicine Teaching and Research Foundation (OTRF) in 2007. OTRF is a nonprofit, 501 (c)(3) organization dedicated to funding research and education for the purpose of keeping people active and healthy.

Dr. Chudik saw a growing demand by patients, athletic trainers and clinicians for up-to-date medical information and unbiased research on injury prevention—especially for children—as well as facts on arthritis and wear and tear on joints, cartilage, tendons, ligaments, etc. To fulfill these requests, OTRF produces and distributes this newsletter, shares information about health performance-related issues like nutrition and fitness, hosts athletic training educational programs, and conducts seminars for healthcare providers and the community. Most important, OTRF funds unbiased research and development particularly in emerging areas such as arthroscopic and minimally invasive surgery for injuries to the meniscus, labrum, rotator cuff, ACL and cartilage.

However, none of this is possible without ongoing financial support. We are extremely grateful to all those who have contributed in the past. Many of the donations came from patients or their family members who benefited from Dr. Chudik's orthopaedic and sports medicine expertise. If you might be interested in helping us continue our educational programs and research, please visit our website, *otrfund.org* and click on the donation link. Or, if you prefer, email me at **contactus@chudikmd.com/**. Also, many companies sponsor programs that match their employees' charitable contributions. Some even match donations made by retirees and/or spouses. Matching gift programs are a great way to double your generosity. Regardless of the amount, every contribution helps make a difference.

Thank you for your interest in our E-newsletter, Active Bones, and the ongoing work of OTRF.

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