

Investigating open surgical and arthroscopic surgical treatments and non surgical alternatives for
femoral acetabular impingement and torn acetabular labrum

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Abstract

The acetabular labrum is a ring of fibrous cartilage that lines the rim of the acetabulum, or hip socket. Patients with labral tears may have mechanical symptoms including restricted range of motion, groin pain, and dynamic instability. An abnormality of the hip structure that commonly co-occurs with labral tears is a femoral acetabular impingement (FAI). FAI is characterized by an abnormal morphological relationship between the femoral head and acetabular cavity, resulting in abutment of the femur against the acetabulum during flexural motion and internal rotations. The initial treatment for labral tears and FAI is normally conservative, including physical therapy and activity changes. However, more advanced cases require surgery. The current study investigates (1) various treatment options and their desirability depending on varying patient needs, and (2) how medical professionals help patients choose a procedure. Results show that there are differing opinions about treatment options among medical professionals, though most prefer to begin with a conservative approach and move to arthroscopic surgery, as necessary. Future research could include a larger sample of orthopedic surgeons and might also include the opinions of other types of medical professionals frequently consulted in making treatment decisions.

Keywords: FAI, torn labrum, arthroscopy, treatment, surgery, hip

Introduction

Mechanisms of injury to the acetabular labrum are largely debated and poorly understood. Although the cause of the injury is sometimes unknown, tears in the acetabular labrum are a well-documented source of discomfort and pain (Guevara, Pietrobon, Carothers, Olson, Vail, 2006), and are a particularly common cause of groin pain in athletes (Narvani, Tsiridis, Kendall, Chaudhuri & Thoman, 2003). Labral tears frequently occur in combination with femoral acetabular impingement. These two injuries and their treatment will be explored in the current paper.

The acetabular labrum is a ring of fibrous cartilage that lines the rim of the acetabulum, or hip socket. It functions as a shock absorber, preventing bones (i.e., the femur and the pelvis) from directly rubbing against each other. It provides for proper joint lubrication and pressure distribution to protect articular cartilage (Bedi, Chen, Robertson & Kelly, 2008), helps keep the femur in place, and increases stability of the joint.

Labral tears are being diagnosed with increased frequency given recent improvements in diagnostic imaging and clinical examination (Bedi et al. 2008; Clohisy, St John & Schutz, 2009; Naal et al. 2011). A tear of the labrum (Figures 1 and 2) can be a result of a fall, an accident, or sports that require regular rotation of the hip. However, most cases have no direct cause, as the tear usually develops gradually (Guevara, Pietrobon, Carothers, Olson, Vail, 2006).

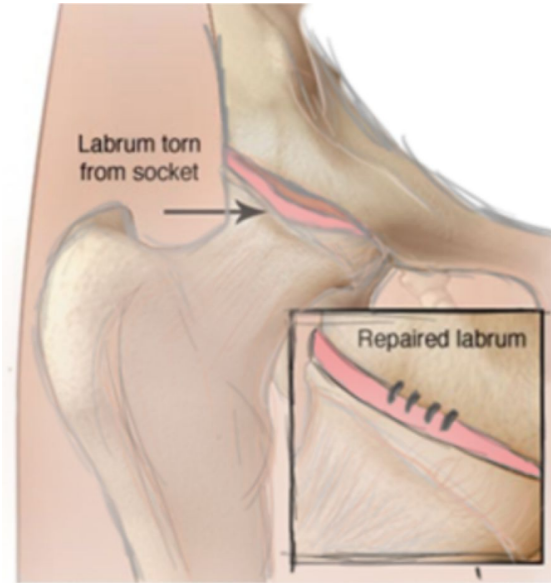


Figure 1. Comparison between a torn and a repaired labrum. (Source: Mayo Foundation for Medical Education and Research)



Figure 2. MRI of an acetabular labral tear. (Source: Author's hip)

Patients with labral tears may have mechanical symptoms including restricted range of motion, groin pain, and dynamic instability (Guevara, Pietrobon, Carothers, Olson & Vail, 2006; Narvani, Tsiridis, Kendall; Chaudhuri & Thomas, 2003). In some cases there are no symptoms, and in others the injury is accompanied by severe groin pain (Crawford & Villar, 2005).

Labral tears are more common in patients who have some sort of abnormality of their hip structure. A likely factor is a congenital bone abnormality which, with repetitive impact of the proximal femoral neck against the acetabular labrum, causes tearing (Guevara, Pietrobon, Carothers, Olson, Vail, 2006). Labral damage indicates ongoing impingement and rarely occurs alone. The most common population of sufferers are young, active patients (Bedi et al. 2008; Clohisy, St. John & Schutz, 2009; Naal et al. 2011).

An abnormality of the hip structure that commonly co-occurs with (and is a potential cause of) labral tears is a femoral acetabular impingement (FAI). FAI is found within the hip joint where the femur meets the pelvis. First described in 1936 by Smith-Petersen (Silvia, Swain, Broderick, McKay, 2016), FAI is characterized by an abnormal morphological relationship between the femoral head and acetabular cavity, resulting in abutment of the femur against the acetabulum during flexural motion and internal rotations (Lourenco, Simoes & Rego, 2015). Specifically, it is a result of either a deformity of the head at the top of the femur (known as cam impingement) or a deformity of the socket (known as a pincer impingement; Figure 3). Either condition can occur alone or they can occur in combination. Both of these deformities can interfere with the smooth motion of the joint and damage the chondrolabral structures during normal movement. A cam impingement is a result of a non-spherical head and causes damage to anterior superior acetabular cartilage with separation between the labrum and cartilage. With

repetitive hip rotation, cartilage can shear off the bone. A pincer impingement is caused by excessive acetabular covering. With hip rotation, the labrum is crushed between the acetabular rim and the femoral neck, a result known as degradation and ossification (Beck, Kalhor, Leunig & Ganz 2004).

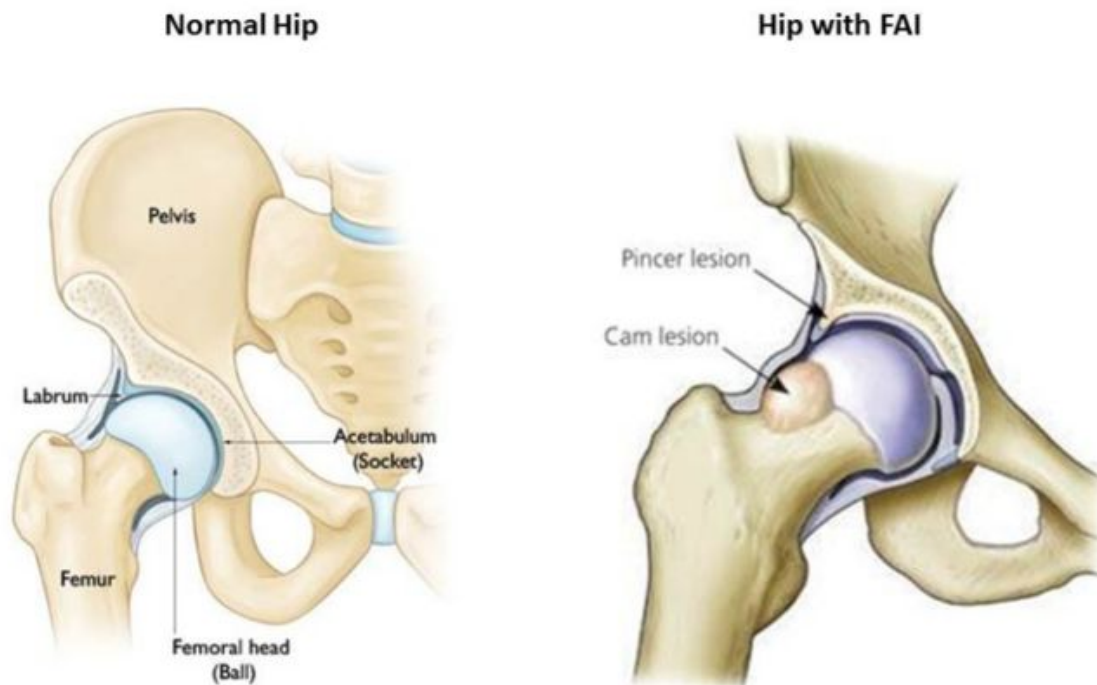


Figure 3. Comparison between a normal hip and a hip with FAI (Pincer and Cam impingement).

(Source: Mayo Foundation for Medical Education and Research)

Sports such as basketball, ice hockey, and soccer, which require repetitive high impact loading, hip flexion, and internal rotation contribute most heavily to cam development (Silva, Swain, Broderick & McKay, 2016). When the hip joint is engaged in high flexion and internal rotation movements, impingement of the labrum occurs (Philippon, Schenker, Briggs & Kuppersmith, 2007).

FAI often develops gradually and is not painful in the early stages. Symptoms may include stiffness in the groin or front of the thigh, and/or loss of the hip's full range of motion (Lodhia, Slobogean, Noonan & Gilbert, 2011). At the start, a patient may feel it when the hip moves near its limits. As FAI worsens, it can be difficult to sit for long periods of time and to walk on an incline. At its worst, the patient will begin to get pain at night and while walking on flat ground, both of which indicate the development of osteoarthritis (Silva, Swain, Broderick & McKay, 2016; Bedi, Zaltz, De La Torre & Kelly, 2011).

Osteoarthritis occurs when cartilage between the joints breaks down, causing joint pain, swelling, and stiffness (Beck, Kalhor, Leunig & Ganz, 2004). FAI was first proposed as a causal factor for the development of early osteoarthritis in non-dysplastic hips in 2003 (Hemtaimish et al. 2013; Philippon, Schenker, Briggs & Koppersmith, 2007; Silva, Swain, Broderick & McKay, 2016; Ikeda, Awaya, Suzuki, Okada & Tada, 1988). FAI is now “widely accepted as a cause of pre arthritic hip disorders, and some investigators postulate that it causes secondary osteoarthritis” (Hunt, Prather, Hayes & Clohisy, 2012, p. 480). “Osteoarthritis” is a general term for joint disorders that present with joint pain and stiffness. “Osteoarthritis is the most common joint disorder in the United States and is the leading cause of disability in the elderly, with nearly 200,000 total hip replacements performed annually” (Lane, 2007, p. 1413). Early surgical treatment for FAI may help prevent joint degeneration, as it effectively reduces intra-articular pressure and stresses approaching the values of a normal hip (Lourenco, Simoes & Rego, 2015; Beck, Kalhor, Leunig & Ganz, 2004).

The initial treatment for labral tears and FAI is normally conservative, non-surgical treatment. For minor cases caught early, this approach can often be sufficient. It can include

things such as activity modification, physical therapy, and medication. Through education, patients are taught how to avoid activities that might aggravate the injury, such as pivoting and crossing one's legs while sitting. Physical therapy often includes exercises to strengthen the hip, to improve core stability and control, and medications can include anti-inflammatories as well as narcotics (Hunt, Prather, Hayes, and Clohisy, 2012). Activities that take the hip through a full range of motion should be avoided when modifying activity (Non-Operative Treatment for FAI, n.d.). Steroid injections can also be used to reduce persistent groin and hip pain (Krych, Griffith, Hudgens, Kuzma, Sierra, & Levy 2014). It can also help orthopedic surgeons diagnose the problem, making sure the patient's pain is coming from the torn labrum, and not another injury with similar symptoms.

However, because a torn labrum does not appear to be able to heal on its own (Ikeda, Awaya, Suzuki, Okada & Tada, 1988), more advanced cases require surgery. Surgery for labral tears and FAI includes multiple components. The labrum is repaired by anchoring it to the bone and/or with debridement (i.e., removing torn pieces). Surgery can also be used to re-contour the femoral neck or acetabular rim, by shaving away the bone that is causing the impingement with the use of a burr (Palmer et al., 2014). For femoral acetabular impingement, both open surgery and arthroscopic surgery are available.

Open surgical dislocation with debridement and osteoplasty (i.e., surgery concerned with bone repair or bone grafting) is often successful in repairing the tear and usually resolves the patient's pain (Bedi, Chen, Robertson, Bryan & Kelly, 2008). It was pioneered by Ganz in 2001 (Ganz, Gill, Gautier, Ganz, Krügel, & Berlemann, 2001). This procedure involves dislocation of the ball from the socket and making a single 7 to 10 inch incision, allowing for complete

visualization of the hip joint. This method takes a few hours and is done as an inpatient surgery, requiring that patients stay in the hospital several days after surgery (Surgery for Femoroacetabular Impingement (FAI), n.d.). A study investigating the management of labral tears and FAI in young patients found that 65% to 94% of 197 patients with a mean follow up of 40 months reported good to excellent outcomes. The failure rate, defined by conversion to total hip arthroplasty (i.e., the surgical reconstruction or replacement of a joint) and/or dissatisfied patients, ranged from 4% to 30% (Bedi, Chen, Robertson, Bryan & Kelly, 2008).

There is a relatively new treatment aimed at early diagnosis and surgical correction. Arthroscopy of the hip was first described in the 1970s but it was pioneered by Ganz in 2003 and is becoming an increasingly common practice for correcting bony pathologies and labral tears in FAI, frequently replacing open surgery as the preferred surgical option (Boster, Smith, Nasser & Domb, 2011). Like arthroscopy of the knee, it involves inserting an arthroscope into two to five incisions that are each $\frac{1}{4}$ inch in size (Surgery for Femoroacetabular Impingement (FAI), n.d.). Arthroscopic surgical series, with minimal invasion, make it possible to inspect most of the superior part of the acetabulum as well as the acetabular labrum (Ikeda, Awaya, Suzuki, Okada & Tada, 1988). This method involves distracting the hip joint, repairing the torn labrum, and FAI decompression. The procedure usually takes about two hours and is done as an outpatient surgery (Surgery for Femoroacetabular Impingement (FAI), n.d.). Out of 271 patients with a mean follow-up of 26 months, 67% to 97% reported good to excellent outcomes. The failure rate, defined by conversion to total hip arthroplasty and/or dissatisfied patients, ranged from 1% to 33% (Bedi, Chen, Robertson, Bryan & Kelly, 2008). In a systematic review of studies conducted in eight different countries using either open or arthroscopic surgery, Matsuda and

colleagues (Matsuda et al. 2011) found that “the arthroscopic method had surgical outcomes equal to or better than the other methods with a lower rate of major complications” (p. 252).

Post surgery, patients are required to be on crutches and recovery time consists of 4 to 6 months before the patient can partake in full, unrestricted activity. Post operative activity level depends on the type of surgery performed, the surgeon’s recommendations, and the condition of the hip joint (Surgery for Femoroacetabular Impingement (FAI), n.d.).

Arthroscopy is a minimally invasive technique and is most recommended for patients inclined to continue their sport activity and those looking to preserve their hip joint as long as possible (Mardones, Gaii Via, Rivera, Tomic, Somarriva, Wainer & Camacho, 2016).

Arthroscopic treatment of FAI shows promising results, with professional athletes able to return to professional sports (Philippon, Schenker, Briggs & Kuppersmith, 2007) and a study of patients of at least 60 years of age seeing significant improvement of functional score and pain in 75% of cases at the mid-term follow up (Mardones, Gaii Via, Rivera, Tomic, Somarriva, Wainer & Camacho, 2016).

Problem Statement

There are multiple options for treatment from which patients and physicians must choose. Factors involved in the decision-making process include recovery time, post treatment functionality, and levels of pain before, during, and after treatment.

Research Questions

What are the comparative benefits of different treatment options for femoral acetabular impingement and torn acetabular labrum, given varying needs of the patient (e.g., post-treatment activity levels)? What is the process by which physicians help their patients choose among treatment options?

Hypotheses

Hypothesis 1: Treatments vary in their desirability depending on varying patient needs (e.g., post-treatment activity levels). Arthroscopic surgery is most desirable for athletes. Non-surgical treatment is an option for patients with low anticipated levels of post-treatment activity.

Hypothesis 2: Physicians actively help patients choose a procedure. Decisions are informed by a number of things including existing literature, prior experience, their surgical expertise, the opinions of other medical specialists (e.g., physical therapists), and the needs and desires of the patient.

Method

Participants

One orthopedic surgeon and twelve physical therapists (PTs) participated in the study. Participants were recruited by letter. Letters were sent to all orthopedic surgeons in the cities of Thousand Oaks and Westlake Village registered on healthgrades.com, after excluding those with specialties in spine, hand, pediatrics, plastics, and joint replacement (see Appendix A for sample letter). In all, twenty-four orthopedic surgeons were contacted (see Appendix B for list of orthopedic surgeons).

The letters sent to orthopedic surgeons included a request that they contact the researcher by email or via cell, for an interview. One orthopedic surgeon responded. He got his medical degree from Georgetown University in 2002, finished his residency at University of Southern California in 2007, and finished his fellowship in at Kerlan and Jobe in 2008. He has since had a private practice and is currently 41 years old.

Seventy-five letters were sent to physical therapists in the cities of Thousand Oaks and Westlake Village (see Appendix C for sample letter). They were sent to the first 75 individuals to appear on a search of healthgrades.com (see Appendix D for list of physical therapists). The letters sent to PTs directed them to a questionnaire on surveymonkey.com. Six females, five males, and one person who preferred not to state his/her sex completed the questionnaire. Their average age was 45 (Mean = 45.16, SD = 13.19) and they had been in practice an average of 18 years (Mean = 18.21, SD = 10.97).

Procedure

An interview was conducted with the orthopedic surgeon. It took place at his office, over his lunch break. The interview consisted of the following questions:

1. How many patients have you seen with a labral tear and FAI within the last year?
2. What is your preferred course of treatment?
3. Are you usually the person with the final say about whether surgery is necessary?

The interview setting allowed for additional follow-up questions and clarification, as necessary.

The surgeon completed a consent form prior to answering questions (see Appendix E for consent form).

The survey for PTs consisted of nine questions that asked things such as their history of work with patients with FAI and acetabular labral tear; the frequency in which they have seen non surgical, open surgery, and arthroscopic surgery; their predictions regarding recovery time; and the benefits and drawbacks of each treatment option (see Appendix F for complete survey). The physical therapists provided passive consent before completing the survey.

Results

Orthopedic Surgeon

The single interview with an orthopedic surgeon led to several findings. When asked how many patients he sees per year, he stated that FAI and labral tears can be quite common, depending on the group of patients at whom you look. These injuries are often seen in professional sports. In the NFL, many positions are affected by this injury, with increased risk for linebackers, in particular. Hockey is another sport in which this injury is commonly present. In the past few years he had seen several hundred per year but operated on a very small percentage of them because it is uncommon that the patient does not respond to more conservative, non-surgical treatment. He states, “It depends on the patient's activity level and how much change in the femoral head--the ball and socket or the socket side--they have.”

When asked what his preferred course of treatment was, he responded by saying that it is crucial to have a partnership with a physical therapist initially because it is almost always a training error that caused the injury or inflammation. Often times, just modifying training helps with the pain. He stated that orthopedic surgeons have to keep in mind that everyone's

physiology and anatomy is different and everyone is able to do different things in terms of plyometrics and other explosive activity, which is a key part of most sports programs. For instance, when it comes to olympic lifting, simply modifying lifts that involve deep squats could result in less impingement or twisting. Impingement occurs when the hip is flexed up and then rotated inwards. He claimed also that physical therapy is a very important first step for “activity modification, training modification and an accommodation for knowing this anatomic change or injury.” For most patients, this step is all they will need.

He suggested further that if physical therapy does not work, the next step is to put patients on anti-inflammatory medications or sometimes an oral steroid. From there, if the patient's pain continues, the next step is to confirm the FAI and labral tear, making sure the problem is not in the back or somewhere outside the hip joint. It may be that the patient has a labral tear but that injury is not the true cause of their pain, and there might be another problem. He indicated that this step is often a clinical challenge. To help diagnose it, he will “give them an injection of some anesthetic or maybe a steroid or something in their hip, or a blood based cell therapy injection, to diagnose and treat them to see if that helps and takes away their pain.” If this treatment is not effective, and the patient’s entire life is being affected, as in they cannot walk normally and their pain is constant and unmanageable, then he recommends surgery to fix the labrum and change some of the bony anatomy to remove impingement.

When asked if orthopedic surgeons have the final say to go into surgery, he stated that yes, he has the final say, but he often looks for guidance from other medical professionals. Sometimes he will send his patients to get a second opinion from a surgeon he knows has done a lot of hip surgeries. Another person can make sure no other elements are missing and may be

able to explain the problem in a different way. He believed this is a good step before going into surgery because it gives everyone involved, both the patient and the surgeon, the confidence to do a more invasive treatment.

Physical Therapists

All PTs participating in this study had treated at least one person with an FAI and an acetabular labral tear. Within the last year, one of them had seen no patients, seven people had seen 1 to 3, one of them had seen 4 to 7, and three people had seen more than eight. Prior to the last year, one of them had seen no patients, two people had seen 1 to 3, four people had seen 4 to 7, and five people had seen more than eight. Numbers of patients seen is illustrated in Figure 4.

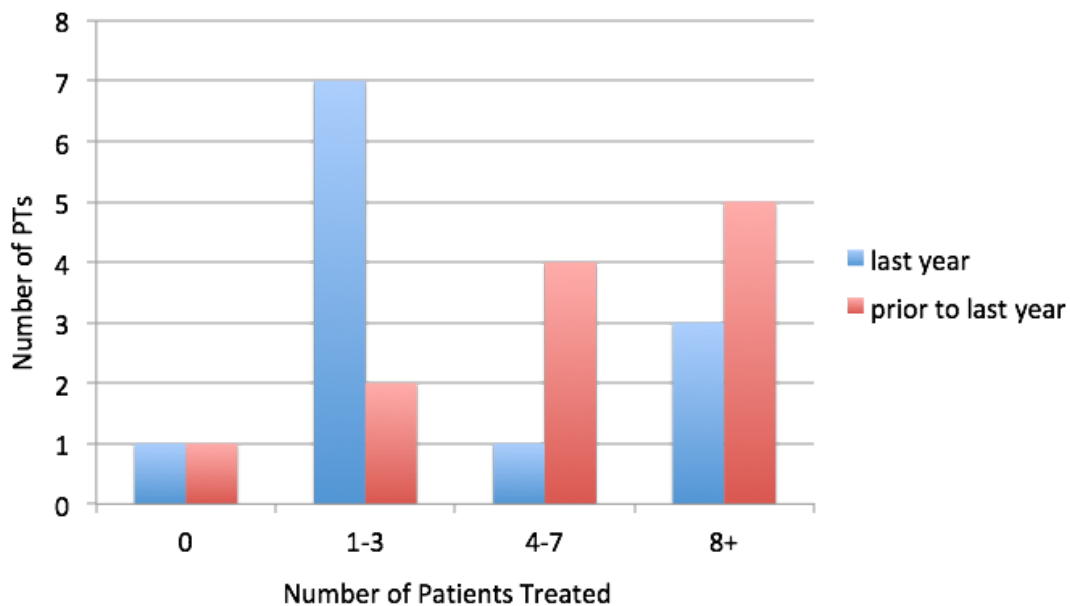


Figure 4. Number of PTs who indicated having treated patients for an FAI and an acetabular tear in the last year and prior to the last year, grouped by number of patients treated.

Two PTs identified that non-surgical was the most common treatment, two PTs identified open surgery as the most common treatment, and eight identified arthroscopic surgery as the most common treatment for FAI and labral tears. Frequencies are illustrated in Figure 5.

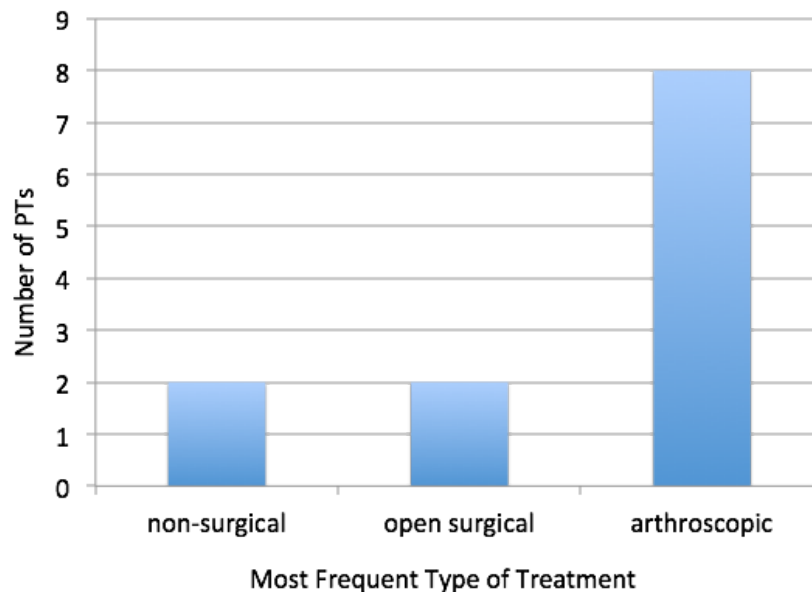


Figure 5. Number of PTs who stated that non-surgical, open surgical, or arthroscopic treatment was the most frequent treatment they had seen for FAI and an acetabular labral tears.

Physical therapists varied in the length of recovery time they anticipated for each of the three treatments. For non-surgical therapies, nine PTs anticipated 1 to 3 months to recover, two PTs anticipated 3 to 6 months to recover, and one person left that question blank. For open surgery, four PTs anticipated 1 to 3 months to recover, three PTs anticipated 3 to 6 months to recover, four PTs stated that they had not worked with a patient who had undergone an open surgery, and one PT left that question blank. For arthroscopic surgery, five PTs anticipated 1 to 3 months to recover, four PTs anticipated 3 to 6 months to recover, two PTs anticipated 6 to 12

months to recover, and one PT left that question blank. Anticipated recovery times are illustrated in Figure 6.

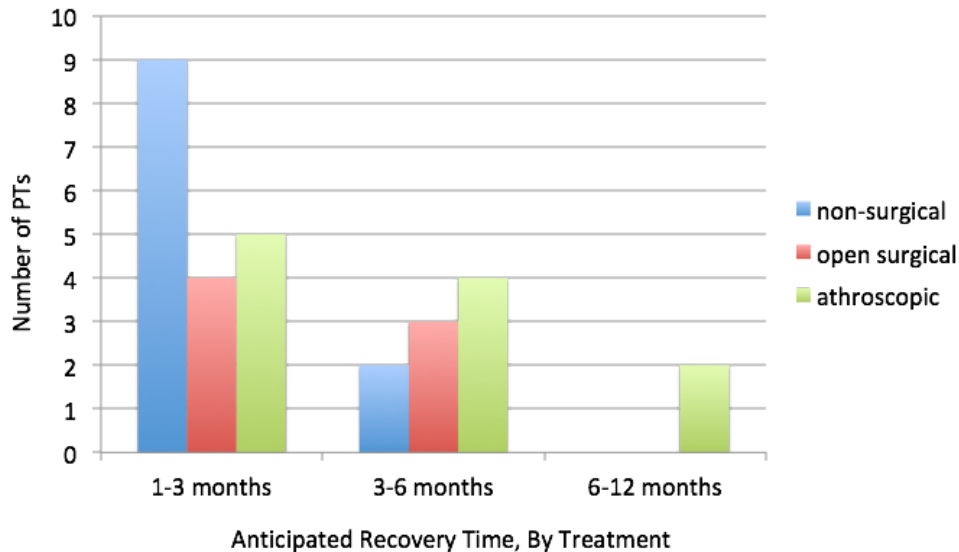


Figure 6. Number of PTs who anticipated various recovery times for non-surgical treatment, open surgery, and arthroscopic surgery for FAI and an acetabular labral tears.

The PTs were asked also to state the benefits and drawbacks of each of the three treatment options.

Benefits of non-surgical treatment. One PT stated that patients could continue in sport if they could tolerate the pain. The other benefits noted by the PTs all focused on advantages of avoiding surgery. Three PTs stated that there would be no postoperative healing necessary, three PTs stated that the treatment would be less invasive, and three PTs stated that the treatment would eliminate the risk of surgical complications and infection. Two PTs did not discuss benefits of non-surgical treatment.

Drawbacks of non-surgical treatment. Five PTs stated that there is a higher likelihood for continued pain and problems with the functionality of the hip joint, one PT stated that there would be a risk of developing osteoarthritis in the joint as a result of pursuing non-surgical treatment alone, two PTs pointed to the potential need for future surgery and intervention, and four PTs did not discuss drawbacks of non-surgical treatment.

Benefits of open surgery. Two PTs stated that there would be complete visualization of the injury. Ten PTs did not respond to benefits of open surgery.

Drawbacks of open surgery. Five PTs stated that open surgery has a long recovery period, two PTs stated that there is a higher risk for surgical complications and infection, and two PTs stated that it was invasive. One PT stated that the more tissue cut, the longer it will take to heal and another PT stated that there is more pain with a larger incision. One PT stated, “‘Fixing’ an anatomical structure is not necessarily going to change someone's pain.”

Benefits of arthroscopic surgery to repair the injury. Five PTs stated that there is a quicker recovery, two PTs stated that there are usually good results that address the pain, and two other PTs pointed out that there is minimal soft tissue damage. One PT stated that there would be less risk for infection, another PT stated that the patients have the potential to return to jobs or other activities, and one PT stated that the patient is less likely to have hip osteoarthritis.

Drawbacks of arthroscopic surgery. Two PTs stated that there is a longer recovery period, two PTs stated that the surgery could cause unnecessary damage to hip nerves or musculature, and another PT stated the risk of infection. A concern of one PT was that the surgeon may not be able to fully visualize the problem and another PT stated that the patient

would be non-weight bearing for several weeks. Five PTs did not discuss drawbacks of arthroscopic surgery.

There is an ongoing discussion whether or not FAI and labral tears are being over or under diagnosed. Four PTs stated that they believed they are overdiagnosed, one even calling it the “new ‘hot’ diagnosis,” whereas two PTs stated they were being underdiagnosed. Three PTs stated that it is better to start with conservative treatment, like modifying exercise. One PT argued that all other injuries that may behave similarly to FAI and labral tear, need to be ruled out first. One PT stated that if pain is sufficient, surgery is the best option and another PT suggested that picking a surgeon who has done the procedure many times before will give the patients the best results. One PT found that arthroscopic surgery had favorable results. Some PTs stated more than one of these themes in their responses. Two PTs did not share any additional opinions they had on FAI and labral tears.

Discussion

The first hypothesis of this study was that treatments vary in their desirability depending on varying patient needs. It was anticipated that arthroscopic surgery would be reported as most desirable for athletes, with non-surgical treatment being an option for patients with low anticipated levels of post-treatment activity. Past literature has documented that the labrum tears with increasing impact. The more impact, the greater the opportunity for tearing and the worse the possible pain. For this reason, patients who have a higher activity level with more hip rotation will have increasing amounts of injury and severe groin pain. Consistent with this, the orthopedic surgeon interviewed reported that he sees many people with this injury, but the

majority of the patients he treats with surgery are devoted athletes. For them, although he normally begins with conservative treatment, he often finds it to be insufficient. Results from PTs were mixed. Some said that the majority if not all of their patients have been treated with surgery, while others said that they get many patients who come in for PT as their first course of treatment and they have found that it is adequate for most patients' desired outcome.

The severity of patients' injuries vary widely, and for many, physical therapy is the first step toward recovery. Thus, it would be natural to report that patients with minor injury were satisfied with conservative treatment. Likewise, patients with more severe injury tend to go to orthopedic surgeons. Logically, they would see more people in need of more radical treatment, such as medication, steroid injections, and/or surgery. These two groups of medical professionals serve two overlapping, but different populations of patients. Some of the patients treated by PTs have injuries that never require escalation to a surgeon.

PTs answered at length regarding the benefits and drawbacks of non-surgical treatment, open surgery, and arthroscopic surgery. One of their biggest concerns with surgery was the risk of surgical complications, including infection and damage to musculature and soft tissue. These risks are more prevalent in open surgery than they are in arthroscopic surgery. Some also suggested that surgery does not always eliminate patients' pain. Finally, there were concerns from the PTs that the recovery period after surgery can be extensive and debilitating. This can come with frustration, especially for those who are active. Other, more conservative, treatments were not without drawbacks. For instance, physical therapy may not be a long term solution, especially because the injury has a reputation of worsening over time.

Many respondents, the surgeon included, expressed a desire for conservative treatment to be the initial approach and the hope that this would be sufficient. For those requiring treatment beyond what conservative therapies provide, surgery offers the benefits of repairing the very source of the pain, both the cartilage and the bone. Arthroscopic surgery enable for full repair with little incision pain, soft tissue damage, and not as much muscle being harmed. The only benefit of open surgery is that the surgeon has complete visualization of the joint.

The second hypothesis of this study was that physicians actively help patients choose a procedure. Those decisions were expected to be informed by a number of things including existing literature, prior experience, surgical expertise, the opinions of various other medical specialists, and the needs and desires of the patient. There was only one surgeon interviewed for the study so data relating to this research question is limited. What can be said, however, is that surgeons have a protocol established for patients who present with pain that may be caused by FAI and labral tears. That protocol involved recommendations for changing activity, referral to a physical therapist, medication, and finally surgery. They rely heavily on the expertise of PTs, X-Ray and MRI technicians, and second opinions from other surgeons. Ultimately though, the physician takes final responsibility for the decision to proceed with surgery.

Response rates are worth noting. Only one of the surgeons contacted responded to the request for an interview. This might be explained by the anticipated time requirement of the interview and the busy schedules of surgeons. I had hoped to get more in depth with them and therefore pursued an interview. It may have been more advantageous to have suggested to surgeons that they, like the PTs, would respond to a survey. The response rate for PTs was far higher, that is 16%. This might have been because of a less demanding form of participation,

because they have less demanding schedules on average or that they had no experience treating patients with FAI and acetabular tears. It makes sense that all PTs had experience with FAI and acetabular labral tears. Other PTs would have likely quit the survey after the initial two questions.

PTs saw comparatively few open surgeries. This was due to the fact that the procedure is largely being replaced by arthroscopic surgery. The benefits of which outweigh those of open surgery.

Conclusion

The sample in this study included surgeons and PTs in Thousand Oaks and Westlake Village, CA. It is not meant to be representative of the state or the nation as a whole. The sample was, however, representative of a medium-sized city in the United States. If you are a patient faced with hip pain and wishing to find treatment, these are the individuals upon whose advice you might rely. Treatment of labral tears and FAI can be complex and medical professionals have different opinions about the benefits, drawbacks, and expected recovery time. For that reason, it is wise for patients to become informed themselves about the various procedures that might be used and, as necessary, to seek the advice of multiple professionals.

In a study to follow up the present work, more orthopedic surgeons should be interviewed. Data collection could also be expanded to include X-Ray and MRI technicians who play a critical role in consulting with doctors. Through the present study, I discovered that their medical expertise are part of the decision making process for the various treatments. Research

might also be more narrowly focused on patients with particular ages or activity levels to see if there is variation in treatment desirability.

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Appendix A: Sample of Orthopedic Surgeon Recruitment Letter



March 2, 2018

Mark Getelman, MD
375 Rolling Oaks Dr, Suite 210
Thousand Oaks, CA 91361

Dear Dr. Getelman,

My name is Kathryn Givvin and I'm part of the Center for Advanced Studies and Research at Thousand Oaks High School. Part of the AP Capstone program, the Center teaches students the foundations of conducting research. As a junior, I'm conducting secondary research on femoral acetabular impingement and labral tears and comparing various treatments. I'd like to include primary data in my project, as well, and am therefore reaching out to orthopedic surgeons and physical therapists who have first-hand experience treating patients with the conditions.

I know your time is valuable. If you can spare 15 minutes to meet in person, I would be grateful. However, if it would be more convenient for you to answer a few questions by email, I'd be very happy to accommodate. Either way, I'd very much appreciate your contribution to my project.

Sincerely,

Kathryn Givvin
kathryn.givvin@gmail.com (please cc my instructor, Dr. Malhotra at nmalhotra@conejousd.org)
805-338-1254

Appendix B: Orthopedic Surgeons

Michael Vercillo, MD
375 Rolling Oaks Dr, Suite 200
Thousand Oaks, CA 91361

Keith A. Robertson, MD
696 Hampshire Rd, Suite 180
Westlake Village, CA 91361

Mark Getelman, MD
375 Rolling Oaks Dr, Suite 210
Thousand Oaks, CA 91361

Walter A Thomas, MD
696 Hampshire Rd, Suite 200
Westlake Village, CA 91361

Michael Bahk, MD
375 Rolling Oaks Dr, Suite 210
Thousand Oaks, CA 91361

Gregg Martman, MD
2230 Lynn Rd., Suite 220
Thousand Oaks, CA 91360

Ronald Karzel, MD
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Thousand Oaks, CA 91361

Joseph Turk, MD
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Roger Bentley, MD
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Thousand Oaks, CA 91361

Brian Bashner MD
110 Jensen Ct, Suite 2A
Thousand Oaks, CA 91360

Eric Hohn, MD
375 Rolling Oaks Dr, Suite 210
Thousand Oaks, CA 91361

Eli Ziv, MD
110 Jensen Ct, Suite 2A
Thousand Oaks, CA 91360

Sean Haloman, MD
375 Rolling Oaks Dr, Suite 210
Thousand Oaks, CA 91361

Gregory Tchejyan, MD
250 Lombard St., Suite 1
Thousand Oaks, CA 91360

Richard Spelts, DO
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Thousand Oaks, CA 91361

Evan Bachner, MD
1220 La Venta Dr., Suite 202
Westlake Village, CA 91361

Tjerk Bury, MD
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Sumit Rana, MD
1220 La Venta Dr., Suite 202
Westlake Village, CA 91361

Kevin Nadel, MD
1220 La Venta Dr., Suite 202
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Robert Fields, MD
1220 La Venta Dr., Suite 202
Westlake Village, CA 91361

James Fox, MD
1220 La Venta Dr., Suite 202
Westlake Village, CA 91361

Elliott Schaffzin, MD

430 E. Avenida De Los Arboles, Suite 101
Thousand Oaks, CA 91360

Stephen Gomberg, MD
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Westlake Village, CA 91361

Melvin Pizitz, MD
141 Triunfo Canyon Rd., Suite 101
Westlake Village, CA 91361

Appendix C: Physical Therapist Recruitment Letter



March 2, 2018

Joane Chamberlain, MA
166 N Moorpark Rd Ste 305
Thousand Oaks, CA 91360

Dear Ms. Chamberlain,

My name is Kathryn Givvin and I'm part of the Center for Advanced Studies and Research at Thousand Oaks High School. Part of the AP Capstone program, the Center teaches students the foundations of conducting research. As a junior, I'm conducting secondary research on femoral acetabular impingement and acetabular labral tears and comparing various treatments. I'd like to include primary data in my project, as well, and am therefore reaching out to orthopedic surgeons and physical therapists who have first-hand experience treating patients with these conditions.

I know your time is valuable. If you can spare 5-10 minutes to complete a questionnaire, I would be most grateful. You can find the questionnaire at <https://tinyurl.com/tohsPTstudy>.

If you have any questions, feel free to contact me at kathryn.givvin@gmail.com (please cc my instructor, Dr. Malhotra at nmalhotra@conejousd.org).

Sincerely,

Kathryn Givvin

Appendix D: Physical Therapists

Joane Chamberlain, MA
166 N Moorpark Rd Ste 305
Thousand Oaks, CA 91360

Nadine Bartley, RPT
2667 N Moorpark Rd Ste 108
Thousand Oaks, CA 91360

Jeffrey Cooper, RPT
2667 N Moorpark Rd Ste 108
Thousand Oaks, CA 91360

Paul Schmutz, PT
509 Marlin St Ste 135
Thousand Oaks, CA 91360

Robert Pinkston, RPT
299 W Hillcrest Dr Ste 117
Thousand Oaks, CA 91360

Jennifer Vonarb, MPT
90 E Thousand Oaks Blvd Ste 200
Thousand Oaks, CA 91360

Denise Menchaca, MPT
101 Jensen Ct Ste 2C
Thousand Oaks, CA 91360

Bernard Budnik, PT
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Thousand Oaks, CA 91360

Dr. Angela Spuill, DPT
325 Rolling Oaks Dr Ste 210
Thousand Oaks, CA 91361

Ian Robinson, PT
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Thousand Oaks, CA 91320

Lauren Meador, PT
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Eric Honbo, MPT
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Westlake Village, CA 91362

Dr. Michael Bender, DPT
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Westlake Village, CA 91362

Dr. Stephen Clark, DPT
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Westlake Village, CA 91362

Justin Brouhard, PT
343 S Moorpark Rd
Thousand Oaks, CA 91361

Zachary Ray, PT
3262 E Thousand Oaks Blvd Ste 100
Thousand Oaks, CA 91362

Dr. Nicole Tapking, DPT
2166 N Moorpark Rd Ste 200
Thousand Oaks, CA 91360

Danielle Cooper, PT

2166 N Moorpark Rd Ste 200
Thousand Oaks, CA 91360

Amy Eschenberg, PT
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Thousand Oaks, CA 91360

Dr. Cody Jones, DPT
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Thousand Oaks CA 91360

Rebecca Araki, PT
2230 Lynn Rd Ste 220
Thousand Oaks CA 91360

Jared Sinn, PT
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Claire Whitlock, PT
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Dr. Aline Harmandjian, DPT
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Christine Goehring, PT
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Mitra Nedjati, PT
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Margerie Calvario, PT
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Kristen Jirele, MSPT
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Dr. James Cummings, DPT
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Dr. Michelle Bourke, DPT
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Fan Stimpson, MPT
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Dr. Derrick Isa, DPT
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Dr. Cara Rademaker, DPT
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Crista Taylor, MPT
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Hannah Silverman, MPT
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Dr. Stephanie Golnik, DPT
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Dr. Deanna Burt, DPT
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Rebecca Anders, MPT
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Ranju Jeffrey, MPT
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Bryan Arias, MPT
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Patricia Taylor, PT
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Julia Schmutz, PT
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Henry Cruz, PT
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Sarah Webb, PT
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Thousand Oaks, CA 91360

James Johnson PT
101 Jensen Ct Ste 2C
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Kathryn Johnson, RPT
1329 E Thousand Oaks Blvd Ste 118
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Kamesha Nabors, PT
415 Rolling Oaks Dr
Thousand Oaks, CA 91361

Cheryl Schuhmann-Wertheimer, PT
415 Rolling Oaks Dr
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Dr. Angela Seeger, DPT
325 Rolling Oaks Dr Ste 210
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Holly Moody, PT
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Artin Petokian
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Stacia Watson
325 Rolling Oaks Dr Ste 210
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Dr. Danielle Jones, DPT
325 Rolling Oaks Dr Ste 210
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Michael Burns, PT
325 Rolling Oaks Dr Ste 210
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Dr. Andrea Gutierrez, DPT
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Lisa Weeks, PT
325 Rolling Oaks Dr Ste 210
Thousand Oaks, CA 91361

Jane Maryoung, RPT
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Nicole Sanada, PT

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Jessica Von Den Stemmen, MPT
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Melinda Klein, MPT
1220 La Venta Dr Ste 102
Westlake Village, CA 91361

Appendix E: Consent Form (Written based on a template provided by UCLA)

CONSENT TO PARTICIPATE IN RESEARCH

Investigating open surgical and arthroscopic surgical treatments and non surgical alternatives for femoral acetabular impingement and torn acetabular labrum

Kathryn Givvin, from the AP Research- STEM at the Thousand Oaks High School (TOHS) is conducting a research study.

You were selected as a possible participant in this study because you would be able to provide primary data, as a person working directly with arthroscopic surgical series and their non surgical options for femoral acetabular impingement and torn acetabular labrum. Your participation in this research study is voluntary.

Why is this study being done?

This study is being conducted to ensure that patients with femoral acetabular impingement and torn acetabular labrum can make the best medical decision for their specific situation.

What will happen if I take part in this research study?

If you volunteer to participate in this study, the researcher will ask you to do the following:

- Questions relating to your education, career, and experience with FAI and torn acetabular labrum
- All interview questions will be confidential unless specified otherwise
- The interview will take place at the location most convenient to the interviewee
- This study is non-experimental

How long will I be in the research study?

Participation will take a total of about 20 minutes. With no other follow-up interviews, unless requested by the interviewee.

Are there any potential risks or discomforts that I can expect from this study?

- There are no anticipated risks or discomforts.
- All questions are voluntary.

Are there any potential benefits if I participate?

You are unlikely to directly benefit from your participation in the research.

Will information about me and my participation be kept confidential?

Any information that is obtained in connection with this study and that can identify you will remain confidential. It will be disclosed only with your permission or as required by law.

What are my rights if I take part in this study?

- You can choose whether or not you want to be in this study, and you may withdraw your consent and discontinue participation at any time.
- Whatever decision you make, there will be no penalty to you, and no loss of benefits to which you were otherwise entitled.
- You may refuse to answer any questions that you do not want to answer and still remain in the study.

Who can I contact if I have questions about this study?

If you have any questions, comments or concerns about the research, you can talk to the one of the researchers. Please contact:

Student: Kathryn Givvin	Cell: (805) 338-1254	Email: kathryn.givvin@gmail.com
Mentor: Dr. Karen Givvin	Cell: (805) 573-5156	Email: karen.givvin@ucla.edu
Mentor: Dr. Mitchell LeBlanc		Email: m.leblanc@callutheran.edu
Instructor: Dr. Nikki Malhotra		Email: nmalhotra@conejousd.org

You will be given a copy of this information to keep for your records.

SIGNATURE OF STUDY PARTICIPANT

Name of Participant

Signature of Participant

Date

SIGNATURE OF PERSON OBTAINING CONSENT

Name of Person Obtaining Consent

Contact Number

Signature of Person Obtaining
Consent

Date

Appendix F: Physical Therapist Survey

1. In the last year, how many patients have you worked with who are recovering from an FAI and an acetabular labral tear?
 - a. 0
 - b. 1-3
 - c. 4-7
 - d. 8+

2. Prior to the last year, how many patients have you worked with who were recovering from an FAI and an acetabular labral tear?
 - a. 0
 - b. 1-3
 - c. 4-7
 - d. 8+

3. What is the most common treatment you have seen for FAI and labral tears?
 - a. Non surgical
 - b. Open surgery
 - c. Arthroscopic surgery

4. For patients receiving the three different treatment options (i.e., non surgical, open surgery, arthroscopic surgery) what is the average recovery time?

5. What are the benefits and drawbacks of each of the three different treatment options?

6. Please share any opinion you may have about FAI and acetabular labral tears.

7. What is your sex?

- a. Male
 - b. Female
 - c. Prefer not to state
8. What is your age?
 9. How long have you been in practice?