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Osteochondritis Dissecans (OCD): A Case Report

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Osteochondritis Dissecans (OCD): A CASE REPORT

by

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This Scholarly Project, submitted by Brady Meyer in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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(Chairperson, Physical Therapy)

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TABLE OF CONTENTS

LIST OF TABLES

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Abstract

Background and Purpose: Osteochondritis Diseccans, (OCD) is the separation of articular cartilage and its adjacent underlying subchondral bone from the articular surface of a joint. Multiple hypotheses have been put forward regarding the cause of OCD including inflammation, ossification abnormalities, ischemia, and repetitive microtrauma. At this time, there is no single cause regarding the etiology of OCD. The purpose of this case study is to describe the physical therapy interventions performed on a college athlete for non-operative treatment of OCD. To also look at the non-operative treatment that the patient underwent, and determine if treatment could delay or stop surgical repair of the lesion in the future. **Methods/Case Description:** A 20 year-old male was referred to physical therapy by his athletic trainer. He had intermittent pain while participating in college baseball. As his condition worsened, he went to his primary physician for the unknown left knee pain, and an MRI was performed. The MRI results concluded that he had a grade 3 OCD lesion of the left femoral condyle. The orthopedic surgeon performed an arthroscopic chondroplasty to remove torn cartilage in his left knee. The surgeon decided not to repair the OCD lesion as it was still 50% intact and would have probably prolonged rehabilitation recovery, limiting the patient from playing baseball in the upcoming spring. **Intervention/Findings:** Based on the patient's diagnosis and examination findings, a rehabilitation program was developed to address his weakness and areas for improvement to further progress him toward his prior level of function (PLOF) and return to baseball. The treatment sessions consisted of patient education, directional preference exercises, range of motion, a progressive strengthening program,

balance and early agility exercises, modalities for pain and inflammation control, and a home exercise program (HEP). Grastin technique was also performed on his left quadriceps muscle with majority of the time concentrated on mobilizing the VMO. **Clinical Relevance/Outcomes:** The patient showed consistent improvement throughout his rehabilitation including decreased inflammation and pain, increase in strength and endurance, increase in AROM/PROM, increase in balance and proprioception, and overall functional capacity. **Discussion/Conclusion:** The patient made good gains in overall functional capacity throughout six weeks. He was on track and making appropriate progress towards his long term goal of being able to play baseball in the spring with minor to no limitations. The limitation about OCD is the unknown etiology. Further research is needed to determine the cause. Current hypotheses regarding the cause of OCD include inflammation, ossification abnormalities, ischemia, and repetitive microtrauma. These causes are all treatable through physical therapy and in this case were treated by physical therapy, while avoiding surgical reattachment of the OCD lesion, and obtaining the patient's PLOF.

CHAPTER I

BACKGROUND AND PURPOSE

Osteochondritis dissecans, (OCD) is the separation of articular cartilage and its adjacent underlying subchondral bone from the articular surface of a joint.[1] Multiple hypotheses have been put forward regarding the cause of OCD including inflammation, ossification abnormalities, ischemia, and repetitive microtrauma. At this time, there is no single cause regarding the etiology of OCD.[2]

An OCD lesion of the knee is a common cause of knee pain in skeletally immature patients.[3] Lennart et al[4] studied 165 patients that were diagnosed with OCD and found that the disease is more common in boys (70%) than girls (30%). The mean age was about the same for boys (12.8 years) and girls (12.6 years), and the most common site for OCD was often in the medial femoral condyle (81%).

There are four classifications or grades of OCD that are used to diagnose the severity of the lesion. A grade one lesion is an intact lesion showing no signs of separation from the articular cartilage and underlying subchondral bone. Grade two lesions show early signs of separation, and a lesion that is partially attached is classified as a grade three lesion. A grade four lesion is classified as a crater lesion with a loose body.[3] Magnetic resonance imaging (MRI) is the gold standard for diagnosing the grade of the lesion most accurately,[4] with arthroscopic surgery confirming severity of the lesion.[5]

There are two treatment procedures for a diagnosis of OCD, a conservative non-operative procedure and an invasive surgical procedure. Sanders and Crim[6] stated that "knowing when to prescribe conservative versus surgical therapy requires staging of the lesion." Literature has shown that 50% of patients with stable lesions are treated successfully with non-operative treatment.[7] The patient may at first opt to do nonsurgical treatment. Conservative management for juvenile and adult patients with stable lesions may consist of non-weight bearing for six to eight weeks, followed by restricted sports and other activities for six weeks. Other conservative treatments include, knee immobilization, daily ROM exercises, and isometric strengthening exercises. A return to normal activities is advocated only after clinical and diagnostic evidence indicates that the lesion has healed.[8]

The other option for a patient is surgery. The surgical procedures to repair an OCD lesion are to treat with abrasion, microfracture, osteochondral autograft transfer, osteochondral allograft, or autologous chondrocyte implantation. If the lesion is graded at a one or two, the surgeon will excise the lesion if needed, and drill small holes into the subchondral bone so that the bone bleeds and facilitates new growth. This surgical procedure is called microfracturing. Drilling has an 80% to 90% success rate compared to a non-operative means, but both of these treatments are only successful for a grade one or two OCD lesion.[2]

According to Magnussen et al, [2] the most agreed upon surgical technique for a grade four lesion is an open reduction internal fixation (ORIF) with one or two metal cortex screws, depending on the size of the lesion. He hypothesize that an ORIF performed on a grade four lesion will heal and result in "normal" knee function at long-term follow up. The clinical outcome from this case study showed that of the 12 patients with a grade four OCD lesion, 92%

resulted in a stable union when an ORIF was performed. A nine year follow-up showed the 12 patients had minimal pain and exhibited normal function in activities of daily living (ADL). With this result, the patients however reported significantly lower knee-related quality of life.

The purpose of this case study is to describe the physical therapy interventions performed on a college athlete for non-surgical treatment of OCD, after having arthroscopic surgery due to torn cartilage in his left knee.

CHAPTER II

CASE DESCRIPTION

History

A 20 year old male was referred to physical therapy by his athletic trainer. Two years prior, he began having left knee pain due to an unknown event. He continued to perform daily and extracurricular activities throughout his senior year of high school without going to his primary physician about the knee pain. He continued to have intermittent pain throughout the next year with increased pain while participating in sporting events. As his condition worsened, he finally went to his primary physician for the unknown left knee pain, and an MRI was performed. The MRI results concluded that he had a grade three OCD lesion of the left femoral condyle. At that point, he and his physician both agreed to try non-invasive treatment before performing an invasive surgical procedure.

He saw a physical therapist, chiropractor, and massage therapist over the next year in an attempt to decrease the pain and improve stability and mobility. Within this year, none of the nonsurgical treatments improved the patient's status and his left knee continued to become more painful and unstable while participating in sporting events and activities of daily living.

He was referred to an orthopedic surgeon for examination and possible surgery. Following the results from the examination, an arthroscopic chondroplasty of the left medial

femoral condyle was performed to treat a meniscus tear. A week later, he came to physical therapy for evaluation and treatment.

Examination

On examination, a lower extremity functional scale assessment (LEFS) was filled out and he scored a 52/80 (35% disabled), with 0/80 being 100% disabled and 80/80 being 0% disabled. The test-retest reliability of the LEFS scores is r=0.94 (95% lower limit, CI=0.89). The potential error for the LEFS score at any given time is +/- 5.3 scale points (90% CI). A minimal detectable change is nine scale points (90% CI) and minimal clinically important difference is nine scale points (90% CI).[9]

He complained of pain with walking, running, going up and down the stairs, and described the pain as a "catch-like feeling." On a numeric pain scale of 0-10, 0 being no pain at all and 10 being excruciating pain, his pain was 3/10 for dynamic movements and 1/10 in a static position.[10] Ibuprofen was being taken to relieve pain for his left knee. He appeared to be in excellent general health with no communication or learning barriers present.

Observation

Upon observation, there was obvious discomfort in a static sitting position. There was moderate amount of edema present around the left knee, which was concentrated around the incision sites located on the medial side of the patella. He was full weight-bearing during ambulation on the involved extremity, with a noticeable antalgic gait pattern. Upon observing his gait pattern, he showed a decreased step length with his left leg, follow by a quick step through with his right leg. This was due to increased pain of his left knee when weight-bearing,

but maintained good heel to toe contract bilaterally throughout his gait. He had difficulty rising from a seated position to standing, and had mild to moderate pain from flexion to extension of the left knee. There was no noticeable discoloration of the left knee, and the incision sites were dry and healing well.

Palpation

According to Magee[11], passive medial and lateral movement of the patella is carried out to determine its mobility and to compare it with the unaffected side. Normally, the patella should move up to half its width medially and laterally in extension. The patient while supine, presented good alignment of both patellas upon palpation, as well as when walking, squatting, and sitting terminal knee extension (TKE). He reported mild pain upon palpation, more significant on and around the incision sites and lateral aspect of the left patella. There was loss of muscle tone for the left quadriceps, more significant at the vastus medialis. There was no increase in temperature around the left knee as compared with the right knee.

Range of Motion

According to Norkin and White[12], a standard long arm goniometer is the universal goniometer to measure range of motion at a precise reading in degrees for the patient's motion. Active and passive range of motion was measured during the initial evaluation, as well as throughout the course of treatment, and at discharge. Measured in supine, active range of motion (AROM) of the left knee was negative four degrees of knee extension and knee flexion was 139 degrees. Passive range of motion (PROM) of the left knee in supine position, the

patient had full extension (zero degrees) and 145 degrees knee flexion. Full AROM for flexion and extension of the right knee was observed, so no formal measurements were taken.

Sensation and Reflexes

As described by Magee, [11] the patient was in a supine position when testing lower extremity (LE) sensation. Using dermatome patterns as a guiding reference for testing sensation, L1 through S2 were intact with no loss of sensation for the right LE in comparison to the left LE. The left LE L1 and L4 were found to have reduced sensation compared to the right LE. All other dermatome patterns of the left LE were intact with no loss of sensation.

Upon these findings, he was asked about past injuries to the back or lower extremity that would possibly cause decreased sensation in these areas. He mentioned he fell onto his back from a low height, years ago. No medical attention was sought following the fall and he had no ongoing problems. His lower extremity reflexes and reaction time were within normal limits (WNL's) during all therapeutic activities. All dermatomes were considered negative, not neurological in nature, please see table one for sensation changes.

	Left Lower Extremity	Right Lower Extremity
L1- inferior to inguinal ligament	Decreased sensation	Intact with no loss of sensation
L2- anteromedial aspect of mid thigh	Intact with no loss of sensation	Intact with no loss of sensation
L3- VMO region	Intact with no loss of sensation	Intact with no loss of sensation
L4- Medial ankle	Decreased sensation	Intact with no loss of sensation
L5- Dorsum of foot	Intact with no loss of sensation	Intact with no loss of sensation
S1- Lateral border of foot	Intact with no loss of sensation	Intact with no loss of sensation
S2- Back of heel	Intact with no loss of sensation	Intact with no loss of sensation

Table 1: Sensation testing of the lower extremities

Manual Muscle Testing

Manual muscle testing was performed in accordance with the manual muscle testing procedures described by Kendall et al.[13] Upon examining the lower extremity strength, the right lower extremity measured 5/5 (normal) for manual muscle testing (MMT) for hip flexion and extension, knee flexion and extension, and ankle dorsiflexion and plantarflexion. The left lower extremity knee flexion and extension measured 4/5 (good). This was due to recent post-operative arthroscopic chondroplasty. Hip flexion and extension, and ankle dorsiflexion and plantarflexion measured 5/5 (normal).

Special Tests

According to Magee, [11] a series of special tests were performed on the patient to rule out any other pathologies the he might have regarding specifically to his left knee pain. All of the special tests were performed bilaterally to compare the results. These special tests included

Lachman's test, Anterior/Posterior drawer test, Homan's test, Varus/Valgus test, and Apley's test. All of the tests performed resulted in a negative finding. Table two summarizes the findings for each special test performed.

	Left Leg	Right Leg
Lachman's test	Negative (-) for ACL tear	Negative (-) for ACL tear
Anterior/Posterior drawer test	Negative (-) for ACL/PCL tear	Negative (-) for ACL/PCL tear
Homan's test	Negative (-) for DVT	Negative (-) for DVT
Varus/Valgus test	Negative (-) for LCL, MCL, and PCL tear	Negative (-) for LCL, MCL, and PCL tear
Apley's test	Negative (-) for meniscus tear	Negative (-) for meniscus tear

Table 2: Special Tests for bilateral knee structures

Evaluation

Based on the physical and observational examination findings, physical therapy services were appropriate to reduce intermittent pain, increase range of motion, increase strength and endurance, correct gait abnormalities, and increase functional mobility. His balance was not assessed during the initial evaluation because of recent knee arthroscopic chondroplasty. After two weeks post-surgery, pain was reduced to where balance was able to be assessed accurately. His results showed functional balance both in static and dynamic testing. Throughout subsequent therapy sessions, he started to regain strength and stability of his knee, in which higher level balance and proprioceptive exercises were safe to incorporate into the plan of care.

Diagnosis

The patient's medical diagnosis was an OCD lesion of the left knee, at the medial femoral condyle with a partial loose body present. This diagnosis was confirmed by an MRI and arthroscopic chondroplasty. The Guide to Physical Therapist Practice was used to determine the physical therapy diagnosis of OCD. The physical therapy guide code is 4I: Impaired joint mobility, motor function, muscle performance, and range of motion associated with bony or soft tissue surgery. The ICD-9-CM treatment codes are 719.46-joint pain and 717.7-chondromalacia patellae.[14]

Prognosis

According to The Guide to Physical Therapy Practice, [14] it is anticipated that 80% of patients who are classified under this practice pattern will achieve anticipated goals and expected outcomes in six to seventy visits within one to six months. Therapy frequency was four to five times a week for eight weeks to meet expected short and long term goals. The patient's rehabilitation potential was excellent due to being a healthy athlete, having a good nutritional diet, and being very motivated and willing to work hard in therapy to return to his athletic sport. Physical therapy included manual techniques, specific exercises to address movement and soft tissue dysfunction, as well as, therapeutic activities to increase strength and endurance, and modalities to decrease inflammation and pain. He was expected to progress onto a home program to promote independent management of the diagnosis.

CHAPTER III

INTERVENTION

The initial plan after examining and evaluating the patient for OCD was to see him four to five times a week for eight weeks. A total of 26 sessions in six weeks was provided before semester break. The treatment sessions consisted of patient education, directional preference exercises, range of motion, a progressive strengthening program, balance and proprioception exercises, early agility exercises, modalities for pain and inflammation control, and a home exercise program (HEP).

During the initial treatment session, he was educated on the importance of warming up on a stationary bike before performing any kind of therapeutic exercise or activity. He was given three therapeutic exercises to perform for the initial session which were short and long arc quad sets, and a four-way straight leg raise. The four-way straight leg raise consisted of abduction, adduction, flexion, and extension. These three exercises were done with the involved left leg with two and a half pound ankle weights. Verbal cueing was needed during the exercises for proper technique as well as during subsequent treatment sessions. He ended every session throughout the entire treatment program with an ice pack applied onto his left knee for 15 minutes to reduce inflammation and pain. Lastly, he was educated and observed for proper body mechanics and technique when performing the specific exercises as a HEP. The HEP consisted of a heel-to-buttock stretch to gain range of motion of the left knee and reduce

spasticity of his left quadriceps muscle, and the frequency and duration for applying a cold pack.

The first week of therapy consisted of simple therapeutic exercises to strengthen the patient's left quadriceps muscle as his VMO showed significant weakness and loss of tone. He performed a variety of lower extremity exercises including short and long arc quad sets, four-way straight leg raise, three-way calf raise, bilateral lower extremity stool scooting, wall squats, and terminal knee extension with a thera-band. This initial treatment plan was to strengthen the quadriceps muscle after having an arthroscopic chondroplasty of the left medial femoral condyle. Through subsequent treatment sessions, his LE strength and technique began slowly progressing with each therapeutic exercise. Weight and resistance was gradually increased for each exercise, and verbal cues for proper performance was provided when necessary.

In week two and three of therapy, the patient showed normal patellar tracking along with a normal gait pattern being observed. For almost every therapy session, the therapist would add in a new therapeutic exercise and/or activity to the plan of care (POC). At the start of week two, the therapist started performing Grastin on the left quadriceps muscle and concentrated majority of the time on the VMO.

Grastin is a deep soft tissue mobilization to break up any scar tissue the patient may have post-surgery and reduce any inflammation present.[15] The treatment rationale for the Grastin technique is based on the manual soft-tissue mobilization rationale proposed by Cyriax. Friction massage may be used to promote a local hyperemia, massage analgesia, and reduction of scar tissue. It has been hypothesized that late stages of healing are facilitated to completion

by friction. Increased fibroblast recruitment has been demonstrated in Grastin-type soft-tissue mobilization. Application of heavy pressure using the stainless steel instruments has been demonstrated to promote a greater fibroblastic response.[16] It is recommended that an exercise, stretching, and strengthening program be used in conjunction with Grastin technique.[15] The patient was advised he may be sore, bruised, or exhibit small red dots over the area treated, called petechiae.

As he progressed, some exercises were discontinued. These exercises consisted of ones that the patient was performing independently with proper technique and without exacerbation of symptoms. These exercises became his HEP.

Concentration was then placed on balance and proprioception exercises for the patient by the end of the third week of therapy. These balance and proprioception exercises included bilateral hip hikes on a raised surface, step-ups on a BOSU, front to back and side to side movements on a rocker board, ball toss with a weighted ball on a Airex, and eight position straight leg steps in a semi-circle pattern for each extremity. These activities and exercises proved to be very challenging for him initially with verbal cuing given a majority of the time for education and proper technique.

In weeks four through six of therapy, he was on track with his long term goals. By week five, two new therapeutic exercise were added. The patient was educated and shown a bilateral leg press in a supine position and a four-way hip machine that included abduction, adduction, flexion and extension for bilateral LE's. Almost all of the other therapeutic exercises were discontinued in the clinic and given as a HEP. This provided more time for the therapist to

concentrate mainly on balance, proprioception, and early agility activities with an agility ladder. During each week, good progress was made with balance and proprioception of both bilateral LE's. The final two weeks he was performing most of the exercises in a single leg stance, performing for a longer period of duration with shorter rests. He was performing dynamic movement patterns and stopping mid-way, holding that position in a static stance for three to five seconds and repeating.

He continued to slowly increase weight for the leg press and four-way hip machine with minor cues when necessary. By week six, he had switched from a bilateral to a single leg press, decreasing the weight and increasing repetitions. He responded well to this with no exacerbating symptoms in the days to follow. Grastin was still performed on the left quadriceps muscle two times a week, showing good results.

After six weeks of therapy, the fall semester of college ended and he left for winter break. He was sent home with an updated HEP to perform over break to progress towards long term goals with the short term goals being achieved. He was told not to modify or increase weight or resistance with the HEP over break. He was permitted resistive jogging in a pool for increased LE strengthening and endurance. He was re-educated on updated restrictions that was provided by the orthopedic physician. He was given the therapist's office and personal cell phone number and email address for any questions. Upon return for the spring semester of college, he would be re-evaluated and continue physical therapy as needed from the results.

CHAPTER IV

OUTCOMES

In the last week of therapy, the final ROM measurement of the left knee was 143 degrees active flexion and 150 degrees passive flexion. He had full knee extension for both active and passive ROM. His LEFS index score was 68/80, showing a 15% disability before he left for winter break. He had made good gains in his outcome assessments, which also was shown during therapy. The LE strength improved from week one to week six without any set-backs or plateau's in the patient's POC. His knee flexion and extension went from 4/5 to 5/5 for MMT by week three of therapy with decreased muscle guarding.

In the last two weeks, he was ambulating with a normal gait pattern, observing equal step and stride length, normal cadence, and proper heel strike and toe off. His surgeon lifted a restriction for jogging and was started on a treadmill for consistent speed when jogging. His balance and proprioception was more of a challenge for him, but still improved each week. From week one, he was going side-to-side and front to back on a rocker board, having to hold onto something at times to maintain balance, to week six, where he was starting to balance on a BOSU with his single involved leg, which proved to be a challenge.

Almost every day of each week, the patient was progressed on exercises to challenge his strength, balance, proprioception, and agility. This was due to his strong motivation to get back to full strength and function for baseball in the spring. He was coming to therapy five days a

week, for an average of an hour and fifteen minutes a day. He was on track and making appropriate progress towards his long term goal of being able to play baseball in the spring with minor to no limitations.

CHAPTER V

DISCUSSION AND REFLECTION

Research has shown that males are more likely diagnosed with OCD, and that the disorder is found more commonly at the medial femoral condyle when referring to the knee.[4] Findings also show that non-surgical treatment has a 50% success rate for only stable lesions.[7] There is a high percentage of patients with a diagnosis of OCD that need surgery to repair the lesion. The lesion can be repaired in one of two way, either with screws, or taking the lesion out and repairing the bone with abrasion or replace it with an allograft implantation.[2] Having a surgical repair for an OCD lesion, the patient will undergo a longer rehabilitation time versus deciding on conservative treatment. The patient and surgeon will have to take into account the size and location of the lesion when making the clinical decision about how to effectively manage surgical versus conservative treatment.[17]

The patient opted to not go through with repairing the lesion surgically because he wanted to play baseball through the rest of his college eligibility. His orthopedic surgeon performed an arthroscopic chondroplasty without repairing the lesion as 50% of cartilage was still intact. Research has shown that there is a high probability that the patient will have to undergo surgery in the near future to repair the lesion.[2] Conservative management of adult patients older than twenty that have OCD of the knee is rarely recommended in the literature. However, some adult patients with OCD may benefit from physical therapy management.[18,19]

The patient was aware of this and was hopeful that his arthroscopic surgery to remove the loose cartilage around the OCD lesion would last without the lesion breaking off before he is done with his baseball career. This case study was not intended to serve as a standard of care for all patients with osteochondritis dissecans, but rather, to describe the non-operative treatment of an OCD lesion a patient underwent, and if this could delay or stop surgical repair of the lesion in the future.

The etiology of this disease, OCD, is still unknown and a limiting factor in preventing it from occurring.[2] Webb et al[3] stated it could be from hereditary, genetic predisposition, local ischemia, nonunited secondary ossifications centers, inflammatory processes, or repetitive trauma. Most other studies lean towards repetitive trauma. This patient had been a catcher in baseball, having to squat and stand repetitively in games before moving to outfield which could certainly correlate with the other studies. There is still further research needed and recommendations from physicians to further undergo more studies to find out the etiology of OCD.

Conclusion:

Overall, this was an excellent learning experience both academically and personally. In doing this case study, researching in detail on the diagnosis of OCD, I added much to my educational background as a student physical therapist. I also have advanced my skills in searching for good evidence based articles and writing my first full case study on a patient.

Reflective Practice:

I had the opportunity to work with a young, respectful student athlete for six weeks. Working with, and helping him progress back to his PLOF, I learned a lot from his diagnosis of OCD and also developed a good patient-therapist relationship. The patient became significantly more functional with his ADL's and showed good progression in being able to return to sporting activities by the sixth week of therapy. The patient, student physical therapist, and physical therapist were all pleased thus far with the treatment interventions and progression.

It would have helped to see the patient all the way to discharge where he needed no further skilled therapy. This would have put a complete closure to the case study, and also been able to report any other additional information that could show evidence to help treat OCD successfully in a physical therapy standpoint.

In looking back now, there was only one ethical issue that I should have expressed my concern about to my clinical instructor, that being, seeing the patient four to five times a week, for an average of one hour and fifteen minutes. I believe the outpatient clinic where I was working, we were seeing him longer than necessary working towards his goals and PLOF. That, the patient was being over charged in therapeutic exercises and activities.

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