EFFECTS OF PHYSICAL THERAPY ON A PATIENT FOLLOWING TOTAL HIP ARTHROPLASTY DUE TO SHORT-TERM CORTICOSTEROID USE

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The Sage Colleges
School of Health Sciences

In Partial Fulfillment
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ABSTRACT

*Introduction:* Over 230,000 total hip arthroplasties (THA) are performed each year. A THA consists of the surgical replacement of the hip joint with an artificial prosthesis. One of the reasons a person would undergo a THA is from avascular necrosis of the hip joint. Avascular necrosis can be caused when patients are prescribed short-term corticosteroids. After surgery patients are discharged after 3 to 5 days. Many of these patients will seek out physical therapy to aid in recovery. *Case Description:* This case report is a retrospective study that describes out-patient physical therapy management of a 32 year old male status post THA which was due to avascular necrosis from short term corticoid steroid use. *Intervention:* A conservative rehabilitation program was initiated 1 month post operatively with an estimated length of physical therapy of 8 weeks. *Outcomes:* After 2 weeks, the patient progressed to donning/doffing his shoes independently, performing household activities, and descending/descending stairs with minimal discomfort and compensations. The patient discontinued his physical therapy at 2 weeks. *Discussion:* Additional studies are needed to determine the effectiveness of conservative physical therapy of the younger population where THA is not commonly seen.

*Suggested Keywords:* total hip arthroplasty, THA, Prednisone, avascular necrosis, AVN, corticosteroid.
INTRODUCTION

Total hip arthroplasty (THA) is a commonly performed orthopedic procedure with over 230,000 surgeries performed each year. It is estimated that 1-3% of persons over the age of 65 will undergo THA. Numerous long-term studies have calculated success rates in excess of 90% after a minimum of 10 year follow up.\(^1\) According to a study conducted by Passias, the definition of clinical success rate included decrease in pain symptoms, improvement of functional mobility, and satisfaction of the patient. The rate of both primary and revision surgeries were higher in females than males, higher among whites compared to black and higher in those with a higher income level. Common reasons for needing a THA include osteoarthritis, osteonecrosis, rheumatoid arthritis, post-traumatic arthritis, all other inflammatory arthritis, malignancy, hemoglobinopathies, and hip dysplasia. The main indications for THA surgery are disabling pain, functional limitations, radiographic changes, failure of appropriate medical therapy, and stiffness.\(^2\)

A THA consists of the replacement of the hip joint with an artificial prosthesis through surgical intervention.\(^3\) The artificial prosthetic components consist of an acetabular component, femoral head and femoral stem. The femoral stem is made of a metal ball and stem. The acetabular component is a metal shell lined with plastic. There are 2 main types of implants performed for THA; cemented and uncemented. The types of implant used are based on age and patient lifestyle. Cemented prosthesis attach the metal prosthesis to the bone by means of cement epoxy. Uncemented procedures are fixated by the addition of a fine mesh in which the bone grows into. After the surgery, most patients will remain at the hospital for 3-5 days before being discharged home. During this time, patients will work with physical therapists who will teach them how to exercise, walk and perform activities
like dressing, cooking and other household chores. The patient will need to abide by hip precautions in which will minimize the patient's chance of dislocating the involved hip. Anterior hip precautions consist of avoiding combinations of movement such as hip flexion past 90 degrees and bringing the hip across body.

Many of these patients will seek out physical therapy to aid in recovery. Although the average age of patients receiving a THA range from 60 to 80 years and only 3.6% of THA are performed on persons between the ages of 18 and 40\(^2\), a physical therapy plan of care should be developed to address each patient's individual impairments and functional limitations.\(^4\) The plan of care for patients following a THA generally consists of regaining lower extremity range of motion, strength, and minimizing gait deviations. In one study of age related THA surgeries, patient less than 50 years of age had an average 90% success rate at the 10 year follow up depending on the type of THA procedure performed. At 15 years, survival rates dropped to an average 80%. Cemented THA had a better survival rate than uncemented due to once the bone heals on to the prosthesis, there is little chance of the prosthesis loosening. Age or any particular diagnosis group such as primary/secondary osteoarthritis inflammatory disease, fracture, pediatric hip disease, and femoral head necrosis had no benefit from uncemented fixation. According to an article by Hailer, elderly patients which he considered anyone over the age of 50 had negligible differences in survival rates when compared to younger patients.\(^5\) A systematic review by Corbett had shown that cemented implants have a greater longevity when compared to uncemented implants. Cemented prostheses had an 88% survival rate at 10 years while uncemented had an 80% survival rate. The 10 year revision free survival rate for younger patients ranged from 72% to 86%. This study differs from the Hailer study in which revision risk was lower in older
patients with survival rates ranging from 90% to 97%. Theses survival rates were inclusive of cemented, uncemented, and type of prosthesis.

Avascular necrosis (AVN) develops when the blood supply to the hip is injured or clogged causes the bone to die. Approximately 10% of THAs performed in the United States are cases involving AVN of the femoral head. Early signs and symptoms of AVN are difficult to identify. During the early stages of AVN, patients may report minor muscle aches and subsequent imaging may produce negative findings. Once the hip joint is severely damaged from the AVN disease process, a THA becomes the only viable treatment option. Later stages of AVN can cause an aching pain in the groin, pain with movement of the hip, and difficulty walking or limp. Most cases of AVN are due to alcoholism, sickle cell disease, trauma to the hip, lupus, genetic disorders, and steroid use.

A corticosteroid is a prescription medication used for treatment of a wide variety of conditions. Prednisone, a type of corticosteroid, works by replacing steroids that are normally produced by the body. It is a very effective immunosuppressant that can inhibit the inflammatory process of the body and suppress an overactive immune system. When Prednisone is used for an extended duration or is terminated abruptly the body is unable to adapt and modify the levels of naturally-produced steroids within the body, resulting in potentially dangerous side effects. Steroid use is associated with a myriad of side effects, including gastrointestinal ulcers, osteoporosis, infection, and diabetes mellitus. AVN of the femoral head is one universally recognized side effect to steroid therapy and is the most common cause of THA in Asia, with incidence rates ranging from 40 to 57.7%. The duration of steroid treatment, the total cumulative dose, and the highest daily dose of steroids are factors that contribute to patients developing AVN. The definitive pathogenesis for the
development of AVN following Prednisone use is still not clear. A THA procedure is usually performed as a last resort.

Stem cell procedures have been effective in AVN cases. The procedure consists of harvesting stem cells from the patient's bone marrow. The stem cells are then implanted into the patient's necrotic bone in hopes the bone will revascularize. Adult stems cells differ from embryonic since they are not developed while in the embryotic stage. In the medical field adult stem cells have been used to regenerate cells. The stem cells have the ability to replenish cells of organs, skin, liver, bone, and cartilage. The cells are abundant within the adult body and are located in bone marrow and fat.\(^1\)

The purpose of this case report to identify improvements in functional mobility, lower extremity strength, and range of motion in a 32 year old patient after THA due to AVN of the femoral head following short-term corticosteroid use. Research has been approved by the Institutional Review Board at The Sage Colleges in Troy, NY

**CASE DESCRIPTION**

The current study is a retrospective study to assess the effects of physical therapy on a 32 year old male patient status post THA due to AVN of the femoral head following short-term corticosteroid use. The study to be conducted is to evaluate and treat a patient with THA, 1 month post operatively. The patient was on an unknown dosage of Prednisone for low back pain after L4-L5 lumbar fusion for 2 weeks. He had complaints of bilateral hip pain which was caused by AVN both femoral heads. The patient received treatment at large community hospital in which his own stem cells procured from bone marrow was used to grow new bone and eliminate the necrotic process. The stem cell procedure was ineffective which led to THA as the next step. The patient had his left hip replaced via anterior
approach and received 3 weeks of in home physical therapy followed by outpatient physical therapy. The patient was evaluated upon entering the outpatient clinic. The patient lived with his wife and 2 year old son. He is out of work but wished to return to his job as a correctional officer. His normal activities comprise of going to the gym, adult league softball, and taking care of his 2 year old son. The patient wished to return to work and be able to return to daily activities without limitation. After 1 month post-operatively, the patient reported limited discomfort in the left hip and stated that he was independent in donning/doffing socks and shoes with minimal discomfort.

**EXAMINATION**

**PAST MEDICAL HISTORY**

The patient had L4-L5 lumbar fusion in 2009. The patient also has ulcerative colitis that is controlled with medication. The patient denies any other pertinent medical history.

**SYSTEMS REVIEW**

*Integumentary:* The incision site was observed to ensure that there were no signs of infection and that the surgical site was healing appropriately. The patient's incision site appeared dry with minimal scabbing on distal aspect of the wound. Incision site was tender to palpation and scar mobility was decreased. The patient also demonstrated minimal swelling on inferior aspect of incision site. *Cardiovascular/Pulmonary:* Not Tested. *Neuromuscular:* Not Tested. *Musculoskeletal:* The patient's lower extremity was assessed. The patient presented with deficits in both range of motion and strength. Strength and range of motion were tested without breaking anterior hip precautions. Anterior hip precautions consist of not bending the hip past 90 degrees of flexion, no crossing midline with involved
limb, no hip extension over 30 degrees, and refrain from externally rotating over 30 degrees of the involved hip. Refer to test and measures for detailed description of musculoskeletal systems review.

**TEST AND MEASURES**

Patient's posture was assessed, palpation of painful extremity, examination and palpation of incision site. Gait, edema, strength, and range of motion/flexibility were also assessed. The patient's standing posture consisted of a left hip hike and held his left lower extremity in abduction. The patient had no complaints of pain while palpating the incision site. The incision site was dry with slight scabbing on the distal aspect. The patient ambulated with an antalgic gait. The patient abducted his left lower extremity due to limited hip flexor strength which is needed to propel the lower extremity forward for proper ambulation. The patient had a slight toe-in on the involved lower extremity. The patient completed The Lower Extremity Functional Scale (LEFS) upon entering outpatient clinic. The LEFS is used to evaluate the functional impairment of a patient with a disorder to one or both lower extremity. It can be multiple times to show progression and to evaluate the effectiveness of an intervention. The scale consists of 20 questions about how much difficulty they could perform certain everyday activities. Test-retest reliability of the LEF's score was excellent with r=0.94 with a 95% lower limit confidence interval of 0.89. Validity of the LEFS was r=0.64 with a CI of 0.54 according to the literature. The patient scored a 20 out of a possible 80 on the LEFS. The minimum level of detectable change is 9 points at 90% confidence. According to the LEFS, the patient was at only 25% of maximal function. The patient wished to return to work and activities which consisted of walking and running. Strength was not tested secondary to surgery but was assumed to be 3/5 due to his ability to
walk. The patient voiced experiencing constant sharp pain, 7/10 pain with movement and 4/10 pain at best when using the Visual Analog Scale. The patient's hamstring length tested via 90/90 in supine and was within normal limits, however he reported a pain level of 5/10.

The patient was able to actively perform 90 degrees of hip flexion on the left but was limited to 90 degrees due to hip precautions. Hip abduction was 45 degrees passively. The patient's pain levels and decreased strength impaired his ability to perform bed mobility. He required minimal assistance to lift his involved lower extremity onto the table while moving from the seated position to supine. The patient required verbal cueing not to cross his involved extremity across midline while moving from supine to sit. Moving the involved lower extremity across midline is a hip precaution. The patient voiced his ability to perform donning and doffing his shoes with increased difficulty mostly limited due to increased pain at the involved hip. The patient was advised not to perform these activities due to his surgical precautions.

**EVALUATION**

The patient is a 32 year old male 4 weeks status post left THA following AVN of the left femoral head as a result of short term corticosteroid use for pain management. He demonstrated deficits in strength, lower extremity range of motion, gait, and skin integrity due to the surgery. The patient was limited in his activities of daily living, putting on shoes, and bed mobility due to anterior hip precautions. The patient's goal was to regain proper walking and running mechanics to prevent further compensations and injury.

**PRIMARY DIAGNOSIS**

Preferred Practice Pattern 4H: Impaired joint mobility, motor function, muscle performance, and range of motion associated with joint arthroplasty.
SECONDARY DIAGNOSIS

Preferred Practice Pattern 7D: Impaired integumentary integrity associated with full-thickness skin involvement and scar formation.\(^{18}\)

PROGNOSIS

The patient is a good candidate for physical therapy. The patient is young and very eager to return to daily activities without restriction. He will benefit from physical therapy to address improved joint mobility, motor function, muscle performance, and range of motion in order to function safely at work and in his environment. The expected number of visits scheduled was 16 visits, twice a week for 8 weeks.

**Short Term Goals** (1-2 weeks)

1. The patient will be instructed and be able to perform HEP by week 2.
2. The patient will report pain level of decrease by 2-3 levels by week 2.
3. The patient will be able to recite hip precautions independently 5/5 times by week 2.

**Long Term Goals** (4-6 weeks)

1. The patient will report pain level of 1-2/10 at worst to allow for participation in activities without limitation by discharge.
2. The patient will be able to walk independently without antalgic gait by discharge.
3. The patient will demonstrate gross lower extremity strength of at least 4/5 to allow activity without limitation by discharge.

PLAN OF CARE

It was projected that the patient be seen for physical therapy two times a week for 6-8 weeks. According to Table 1, treatment consisted of cold pack as needed, strength and conditioning, passive range of motion, active-assisted range of motion, passive range of
motion, therapeutic exercise, massage, gait training, postural training, balance training, home exercise program, and patient education.

Short arc quads, also called terminal knee extensions when strengthened at end range helped with protecting and stabilizing the knee during walking, running, ambulating stairs, and jumping. The patient began by sitting with the involved leg straight out in front of them. The patient then placed a foam roller under involved knee. The patient straightened the involved knee as far as they could comfortably. At the end of the range, the patient was told to concentrate on contracting their quad muscles, and then slowly return to the starting position. Exercise was progressed with ankle weights as tolerated.

Long arc quads are the progression of short arc quads. This exercise helped to further strengthen the quadriceps muscle. The patient was seated with knees bent to 90 degrees. The patient straightened the knee by contracting their quadriceps muscle. The patient then held their leg in place at end range for 10 seconds and then slowly returned to the starting position. Exercise was progressed with ankle weights.

Standing hamstring curl exercise were given to help strengthen the hamstring muscles. The patient stood up as straight as possible with knees together. The patient bent his involved knee towards his buttocks then slowly returned to the starting position. The patient used a chair or table for balance purposes. The exercise could be progressed with ankle weights.

Standing heel raises were given to strengthen the gastrocnemius muscles. The patient's feet were hip-width apart. The patient then shifted his weight onto the balls of his feet so that he was leaning forward slightly. The patient was then told to rise all the way onto
his toes. The patient should have felt a contraction in his calves and pause for 2 seconds at the top, then slowly lower back into starting position.

Standing hip flexion exercises strengthened the flexor muscles of the hip. The patient's feet were hip width a part. The patient then slowly lifted one leg, keeping the knee bent at 90 degrees. Patient was told to hold for 2 counts and slowly lower back into starting position. The patient was advised not to hip flex past 90 degrees of hip flexion due to hip precautions. This exercise was progressed with ankle weights.

Step up & step downs were performed to strengthen the lower extremity. The patient was instructed to step up with the involved extremity onto the step then steps down to the starting position with the uninvolved leg first.

Inclined gastrocnemius stretches were performed by having the patient place both feet onto the calf block. The patient then leaned his body forward until a stretch was felt behind the calves. Sidelying hip abduction was performed by having the patient lay on his side with legs in the straightened position. The patient's hips and shoulders were situated so they were stacked and aligned vertically to the floor. The patient was told to gently raise the upper leg off of the lower leg until his waist collapses into the floor or until he felt tension develop in his low back or oblique muscles. The exercise was progressed by adding ankle weights.

Narrow base of support on foam exercises were given to the patient by making them balance without assistance. This forced the patient to co-contract the muscles in his leg to correct their balance therefore strengthening that muscle group. The patient stepped onto the Airomat foam with his feet touch side by side. The patient then attempted to keep his balance with his arms across his chest. The exercise could be done with eyes open or close.
Another progression of this exercise involved positioning the feet in semi-tandem and tandem foot alignments.

Rockerboard for dorsiflexion and plantarflexion motion exercises were given to strengthen the dorsiflexor and plantarflexor muscles of the leg. The patient stepped on the rockerboard with feet slightly apart. The patient then pushed down with his toes to tilt the board forward and then pushed down with their heels to tilt it backwards.

Hip adduction with bridge exercises helped strengthen the hip adductors and when paired with a bridge increased core strength. The patient laid supine in a recumbent position. A soccer sized ball was placed between the knees. The patient then slowly squeezed the ball and slowly lifted his hips off the floor. This position was held for 5 seconds then patient was told to slowly lower down into starting position.

The patient required moderate verbal cueing in order to understand and perform hip precautions. He demonstrated visible muscular compensations seen by hip hike on left during standing hip flexion exercises. The patient was compensating using his weak hip flexors by using his quadratus muscle. The patient also required verbal and visual cueing in order to correct this compensation. The treatment plan formulated for this patient took into consideration his age, surgical protocol, hip precautions, and his motivated attitude. The patient was not a "typical" patient following THA due to his age and rapid healing; therefore the treatment plan was comprised of activities that challenged the patient while maintaining his hip precautions.

**OUTCOMES**

The patient was only seen for 2 weeks and attended 4 sessions. He voiced that he wanted to be discharged from physical therapy, stating that he was "not being challenged
enough during the sessions." A written progress note was taken on the day of discharge which included his subjective comments; however full objective measures were not collected on his final day. The patient stated that he had lingering soreness in the left hip and was able to perform work activities within his home, including moving/lifting, picking up his son, and donning/doffing shoes and socks with low pain levels 4/10 VAS with activity. The patient progressed well and tolerated the treatments with minimum pain and compensations. There were only 2 short term goals that were met by the patient. The patient was able to perform his home exercise program independently by the end of week 1. The patient was able to recite his anterior hip precautions independently by the end of week 1. None of the long term goals were met.

DISCUSSION

The patient attended 4 sessions despite recommendations from the physical therapist to continue treatment for functional limitations. He reported progressing to putting on his shoes independently in a seated position, lifting garden hoses, washing his car, ascending/descending stairs, and performing all activities of daily living using a straight cane and experiencing only mild discomfort in his hip. The patient ambulated with a straight cane and frequently performed activities that were not within the hip precautions given by his surgeon. The patient refused to listen to advice by his surgeon and treating physical therapists to follow his hip precautions. The patient's motivation was a big factor in his therapy progression. He would perform activities that were advanced for his healing stage. Treating physical therapists did not feel comfortable moving forward in the protocol due to the patient only being 4 weeks post op. The next phase in the protocol would have been wall
squats, hamstring and quadricep weight machine, single leg heel raises, straight leg raise, and prone hip extension strengthening in standing or prone within precautions.

When patients perform activities that are advanced for their healing stage, hip dislocations can occur. A study by Khatod stated that dislocations occurred in 3.9% of patients 6 months after primary posterior approach THA. The majority of dislocations occur within 1 year after THA. There are 3 factors that are associated with early prosthetic dislocation: patient, implant, and technique. Patient factors include age, gender, diagnosis, and BMI. The Khatod study stated that dislocation rates for persons under 55 years old who underwent primary THA were 3.4%. Of those 3.4%, 2.4% of the sample had a primary diagnosis of osteonecrosis.20

Recent studies have asked if hip precautions are necessary with anterior approach THA. A study conducted by Ververli performed a study in which 2532 patients who underwent anterior approach THA were followed. All patients were put on a no-restriction protocol. This protocol entitled the patient to perform active hip flexion and adduction within their pain threshold. Patients were not given abduction pillows to prevent crossing the surgical leg across midline and elevated toilet seats or chairs to prevent hip flexion over 90 degrees. Patients were allowed to sleep on the operated side, ascend and descend stairs, drive, and be a passenger in an automobile. The patients who were not given any precautions following surgery did not have any increased of dislocations when compared to the restricted group. At 6 months follow up, there were no incidences of dislocations in the unrestricted group. The patients in the unrestricted group had faster return to normal activities and better satisfaction.
Patients in the non-restriction group were faster to ambulate with an assistive device, independent ambulation, and ambulation with muscular compensations.\textsuperscript{21,22} Patients who have anterior approach THA have lower rates of dislocation than patients who have posterior approach THA due to its ease of access, superior visualization, and a predictable healing pattern. Even with this situation, it is up to the referring surgeon discretion of how long to keep hip precautions in affect. The patient in the case study was shown to have progressed faster than the typical THA patient. This was most likely due to his surgery approach, age, and motivation. According to a study performed by Restrepo, hip precautions are not necessary with patients who had undergone anterior approach THA. The limiting factor of this patient case was the referring surgeon’s hip precautions and protocol. The surgeon protocol and hip precautions that were given to the patient in this case study potentially delayed his recovery due to the limitations that were put in place.\textsuperscript{21}

Patients typically attend outpatient physical therapy for about 2 months following a THA and demonstrate improvements in strength, range of motion, pain level, balance, and functional mobility. At this time, the surgeon is likely to allow patients to wean off of their hip precautions and resume typical activities of daily living.\textsuperscript{23} The current patient is not typical of those seen in outpatient physical therapy due to his young age and speedy recovery following surgery. If the patient was not discharged from physical therapy, physical therapy would have progressed to further normalize his gait by having the patient perform wall squats, retro walking, increase walking speed on treadmill, leg press, lateral step up/down, and progress all his previous exercises with weight machines and Theraband.

Outcome measures that would be applicable to this case report would be the Oxford Hip Score which is a 12 question survey on how much difficulty the patient has with
everyday activities and pain levels.\textsuperscript{26} The Harris Hip Score is an outcome measure that scores the patients pain, gait quality and distance, use of assistive device, range of motion, stairs, and donning/doffing shoes and socks.\textsuperscript{25} The Harris Hip Score would have been ideal to use in this case report. It would display progression of the patient's ability to navigate his environment and his return his pain and range of motion to within normal limits. Limitations of this study include: unknown dosage of Prednisone, lack of follow up outcome measures and lack of information regarding the patient's surgical procedure.

Future research can consist of a larger subject group that consists of subjects have THA procedures done solely due to short-term steroid use. By gaining a larger subject group, we can more easily generalize the results of how patients progress through physical therapy treatment. Long term outcomes measures and follow up studies can be conducted to determine the effectiveness of conservative outpatient treatment with patient ranging in age, diversity, and co morbidities.

CONCLUSION

The patient is a 32 year old male who had a THA due to AVN from short term corticosteroid use. The patient came to outpatient physical therapy for 2 weeks. During those 2 weeks, his impairments were addressed. An exercise program was formed to decrease his impairments. His exercise program included strengthening his core and lower extremity muscles and controlling his pain levels with a cold pack. The goal for his treatment was to decrease his pain levels and increase his level of functional mobility so he can resume his daily activities with minimal discomfort and impairments. Treatment would have continued, but patient voiced he was not being challenged enough and would continue physical therapy once his hip precautions were discontinued. During his 2 weeks of sessions,
the patient stated pain had been more manageable and ambulation with straight cane was smoother and less antalgic. The patient's lower extremity functional strength progressed as seen by increased ability to perform exercises with increased weight with no increase in pain levels or bodily compensations.
REFERENCES


### FIGURES

**Table 1.** Intervention Progression for Weeks 1 and 2.

<table>
<thead>
<tr>
<th>Treatment/exercise</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short arc quads</td>
<td>4 lbs. 20x</td>
<td>↑ by 1 lb</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Long arc quads</td>
<td>2 lbs 20x</td>
<td>↑ by 1 lb</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Standing hamstring curls</td>
<td>Lvl 2 TB 20x</td>
<td>↑ by 1 level TB</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Standing heel raises</td>
<td>20x</td>
<td>→</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Standing hip flexion</td>
<td>20x</td>
<td>→</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Step up and downs (6 inch step)</td>
<td>20x medium</td>
<td>→</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Incline gastrocnemius stretch (30 degrees)</td>
<td>3x30 seconds</td>
<td>→</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Sidelying hip abduction</td>
<td>20x</td>
<td>↑ by 2 lbs</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Narrow base of support on Airomat foam</td>
<td>3x30 sec</td>
<td>→</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Rockerboard</td>
<td>Lvl 1 20x</td>
<td>→</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hip adduction with bridge</td>
<td>20x5 sec hold</td>
<td>→</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Treadmill (no incline)</td>
<td>1.5mph 10min</td>
<td>↑ to 1.6mph</td>
<td>→</td>
<td></td>
</tr>
<tr>
<td>Cold pack to left hip</td>
<td>15 min</td>
<td>→</td>
<td>→</td>
<td>Declined</td>
</tr>
</tbody>
</table>
Table 2: Anterolateral THA Physical Therapy Protocol in Comparison to Patient in Case Report

<table>
<thead>
<tr>
<th>Physical Therapy Protocol for Anterolateral THA approach</th>
<th>Patient in case report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POST-OP WEEKS 1 – 6</strong></td>
<td><strong>POST-OP WEEKS 4-5</strong></td>
</tr>
<tr>
<td>Walker or crutches, Weight bearing as tolerated. Progress to cane and discharged when gait is normal</td>
<td>Weight bearing as tolerated with straight cane</td>
</tr>
<tr>
<td>Ankle pumping</td>
<td>Comparable to Rockerboard exercise</td>
</tr>
<tr>
<td>Heel slides, Active and active-assisted range of motion within precautions</td>
<td>Comparable to standing hamstring curls</td>
</tr>
<tr>
<td>Short arc quads</td>
<td>Performed with 5 lbs</td>
</tr>
<tr>
<td>Sitting knee extension (chair or mat) 90-0 degrees</td>
<td>Long arc quads performed with 3 lbs</td>
</tr>
<tr>
<td>Weight shifts in parallel bars</td>
<td>Comparable to narrow base of support on Airomat foam</td>
</tr>
<tr>
<td>Mini squats 0-45 degrees in parallel bars</td>
<td>Comparable to supine bridging</td>
</tr>
<tr>
<td>Forward, retro and lateral step downs (small step)</td>
<td>Performed step up/downs on 6 inch step. Lateral step up/down comparable to sidelying hip abduction</td>
</tr>
<tr>
<td>Double leg heel raises</td>
<td>Performed 20 repetitions</td>
</tr>
<tr>
<td>Stationary bicycle at week 4</td>
<td>Comparable to treadmill walking</td>
</tr>
</tbody>
</table>
IRB APPROVAL LETTER

Sage Graduate Schools
School of Health Sciences — Office of the Dean
651 College Ave
Troy, NY 12180
http://www.sage.edu/ — 518-244-2100

February 21, 2012

Chester Lee
400 McChesney Ave Ext 2-5
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IRB PROPOSAL # 11-12-002
Reviewer: Susan C. Cloninger, Chair

Dear Chester:

The Institutional Review Board has reviewed your application and has approved your project entitled "Effects of Physical Therapy on a Patient Following Total Hip Arthroplasty due to Short-Term Corticosteroid Use." Good luck with your research.

When you have completed collecting your data you will need to submit to the IRB Committee a final report indicating any problems you may have encountered regarding the treatment of human subjects.

Please refer to your IRB Proposal number whenever corresponding with us whether by mail or in person.

Please let me know if you have any questions.

Sincerely,

Susan C. Cloninger
Susan C. Cloninger, PhD
Chair, IRB

SCC/nan

Cc. Dr. Laura Z. Gras