Rehabilitation following an open reduction and internal fixation of the right femur post fracture in a 61 year old male: A case report

Abstract

Objective: This paper will examine a rehabilitation program for a healthy 61 year old male who underwent an open reduction and internal fixation surgery post right femoral diaphyseal fracture.

Results: Following a 15 week treatment plan focusing on active rehabilitation, utilizing isometric, concentric, closed kinetic chain and proprioceptive exercises and a passive component focusing on restoring joint range of motion and soft tissue flexibility, a reported 60-80% resolution of the primary complaint of knee pain and weakness, depending on the activity performed, with the patient resuming most pre injury activities.

Discussion: Conservative care, specifically rehabilitation is a mainstay treatment following surgical repair of the lower extremity and subsequent immobilization. It was found that a rehabilitation program that focused on restoring normal range of movement and strength via isometric, concentric, closed chain kinetic exercises with a focus on increasing both strength and endurance in the quadriceps and hamstring musculature as well as increasing proprioception, was effective.

Key words/MeSH terms: open reduction and internal fixation, femur fracture, rehabilitation, skiing injury

Introduction

Femoral shaft fractures can include a wide spectrum of fracture types, from non-displaced fractures, to fractures associated with severe comminution and a significant amount of soft tissue injury. Fractures that occur to the diaphysis of the femur are generally caused by high-energy forces and in many instances are associated with trauma to other areas of the body. However, isolated injuries can occur with repetitive stress, metabolic bone diseases, metastatic diseases, or primary bone tumors.[1] Open reduction and internal fixation (ORIF) is a commonly utilized treatment for fractures that can occur throughout the body, including but not limited to those to the femur, patella, humerus and tibia.[2,3,4] In most case femoral diaphyseal fractures are treated surgically with intramedullary nails or plate fixation. The primary goal of surgical intervention is to restore function and stability of the affected area, as fractures of the femoral diaphysis may have both significant short and long term effects on the hip and knee joints if alignment is not adequately restored.[1,3] An ORIF involves the use of surgical hardwear to realign fractured segments and secure them into place. The type of hardwear utilized and surgical procedure done can vary depending on the surgeon performing the treatment. Removal of surgical hardwear is often dependent on whether pain or other symptoms are experienced by the patient and on the discretion of the surgeon.[2,3]

Case Report

A 61 year old patient presented to the clinic 7 weeks following sustaining a right femoral fracture requiring an ORIF as a result of a skiing accident. The patient reported a painless numb

region and decreased sensation localized to the lateral aspect of the thigh, specifically overlying the area predominately innervated by the lateral femoral cutaneous nerve. A burning sensation was reported along the ventral aspect of the thigh, especially with increased activity and occasionally on the posterior aspect of the thigh, particularly with prolonged sitting. The patient reported worsening of their symptoms, specifically pain and swelling at the end of the day with improvement in these symptoms at the beginning of the day.

During physical examination it was noted that the patient utilized 2 crutches to ambulate and was actively favoring the affected leg, with minimal weight bearing demonstrated. A recommendation to utilize 1 crutch was discussed and the patient was instructed on proper gait mechanics. Range of motion of the knee was umremarkable for extension actively and with passive overpressure and revealed pain with flexion actively with increased pain (which was described as a pulling sensation into the quadriceps area and pain overlying and inferior to the patella) with passive overpressure. Give way weakness due to pain was noted during resistance testing of the quadriceps and hamstring musculature. Palpation overlying the quadriceps elicited tenderness overlying the mid muscle belly down to the patella. Measurements at superior aspect of patella were 18.5 inches on the right versus 17 inches on the left, 11 inches on the right versus 10 inches on the left at the level of the lateral malleoli and 16.25 inches on the right versus 15.75 inches left at the widest part of the calf.

A diagnosis of disuse atrophy post immobilization following an ORIF of a right femoral fracture and suspected right meralgia parasthetica was made, based on the location of numbness as described by the patient. A two part treatment plan was initiated, with the passive portion of the treatment plan including passive range of motion of the knee, ankle and hip joints and soft tissue stretching of the surrounding musculature, as well as soft tissue treatments to the affected musculture (based on ART protocols) and acupuncture (SP 9, ST 36, Extra 2) . The patient was instructed regarding icing protocols (10 minutes on, 10 minutes off and 10 minutes on) directly following rehabilitation and to control pain. The patient was instructed on hurt vs. harm and was encouraged to begin utilizing the affected leg with more activities.

At the time of the initial assessment ankle exercises utilizing a theraband were prescribed (dorsiflexion, plantar flexion, inversion and eversion) in a seated position, isometric exercises for the quadriceps and hamstring musculature and stretching of the leg musculature (quadriceps, hamstring, gastrocnemius-soleus complex). Proprioceptive exercises, including one leg balancing on a flat surface were intiated as soon as the patient felt confident performing them and were then progressed to utilizing labile surfaces. Gait retraining and a recommendation to progressively decrease the use of walking aides was given. Closed chain concentric strengthening to the leg musculature were prescribed, including wall sits, squats, pelvic bridging (2 legs and 2 legs), hamstring curls on an exercise ball, calf raises, hip abduction utilizing resistant bands. By the 2 week following the initial assessment, the patient was walking with a cane only and reported a 20-25% improvement overall. Core strengthening and postural exercises were also prescribed as part of treatment.

The patient was instructed to perform the strength and conditioning exercises every other day, with as many repetitions as possible with good form and to cease and desist if excessive pain was produced with any exercise. Paperwork including pictorial representations and written instructions of each exercise were provided to the patient at each appointment when new exercises were prescribed. New exercises were reviewed at the subsequent appointment following their initial prescription in order to ensure that they were being done with the proper form.

Following a 15 week treatment plan, the patient was able to perform all exercises was walking without the use of any aide and reported feeling up to 80% improvement. As that time the patient was discharged from an active treatment plan and was instructed to maintain their strength and conditioning rehabilitation protocols. It was recommended that the patient present to the clinic on an 'as needed basis'.

Discussion

Femoral shaft fractures are generally the result of high energy injuries and are often associated with other injuries to bony structures, including tibial shaft fractures, ipsilateral femoral neck fractures and extension of the fracture into the distal femur. Traumatic causes of femoral fractures include high energy trauma. For example falls (generally from height, for example when mountain climbing or pole vaulting), motor vehicle trauma, high-speed and contact sports as well as skiing, football, hockey and gunshot wounds.[1,4] Although the first priority in treatment is to rule out other life-threatening injuries and stabilize the patient, treatment of the femoral shaft fracture itself has undergone significant progressions. Up until the recent past, the definitive method for treating femoral shaft fractures was traction and or splinting and prior to the evolution of modern treatments and techniques, these injuries were often disabling and or fatal. Traction as a treatment option has many drawbacks, including poor control of the length and alignment of the fractured bone, development of pulmonary insufficiency, deep vein thrombosis, and joint stiffness due to supine positioning. The femur is a very vascular structure and many fractures can result in a significant amount of blood loss into the thigh with up to 40% of isolated fractures requiring transfusions due to blood loss, upwards of 3 units of blood.[1] Femoral fracture patterns vary according to the direction of the force applied and the quantity of force absorbed. A perpendicular force results in a transverse fracture pattern, an axial force may injure the hip or knee, and rotational forces may cause spiral or oblique fracture patterns. The amount of comminution present increases with the amount of energy absorbed by the femur at the time of fracture.[1,5]

Conclusion

Rehabilitation is a mainstay treatment following surgical repair and subsequent immobilization, especially to a weight bearing structure. In this instance, it was found that progressive rehabilitation exercises focusing on increasing strength (both muscular strength and endurance), specifically a graded approach beginning with isometric followed by concentric muscular contraction and proprioception training, as well as increasing hip, knee and ankle range of motion were effective in treating this surgically repaired right femoral fracture. Following a 15

week rehabilitation program, the patient indicated that their affected leg felt improved with respect to pain, balance, strength and conditioning. Ambulation without overt signs of limping was noted. The patient was discharged from an active treatment plan and was instructed to maintain the strength and conditioning program. A follow up at 3 months revealed no further complications and a return to pre injury activity levels, with the exception of skiing. The patient indicated that they had officially retired from skiing.

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