ORIGINAL RESEARCH PAPER

Volume-8 | Issue-2 | February-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

REHABILITATION FOLLOWING INTRAMEDULLARY NAILING OF FEMORAL SHAFT FRACTURE: A CASE REPORT

Physiotherapy

Zuheb Ahmed Siddiqui * Assistant Professor (Physiotherapy), Department of Rehabilitation Sciences, SNSAH, Jamia Hamdard, New Delhi, India *Corresponding Author

Hina Siddiqui Tutor, SRMS Institute of Medical Sciences, Bareilly, Uttar Pradesh, India

Noor Mohammad Assistant Professor (Occupational Therapy), Department of Rehabilitation Sciences, SNSAH, Jamia Hamdard, New Delhi, India

Owaise Ahmed Bhat Assistant Professor (Occupational Therapy), Department of Rehabilitation Sciences, SNSAH, Jamia Hamdard, New Delhi, India

ABSTRACT

BACKGROUND: Fractures of the shaft of femur are one of the commonest fractures of the lower extremity with significant blood loss and pain and requiring hospital admission. These injuries may result in long-term disability among the survivors. This case report describes the outcomes of a patient following surgical fixation of mid-shaft femoral fracture and rehabilitation program focusing on early weight bearing and strengthening of thigh muscles.

CASE REPORT: The subject was a 22-year old male driver who sustained a fracture of the right femur in an accident while driving. The patient was treated with surgical fixation of the right femur using intramedullary nailing. Following surgery patient complained of decreased quadriceps strength, hip abductor strength, decreased range of motion (ROM) and gait disturbance. Rehabilitation focused on muscle strength, improving ROM with exercises for hip, knee, ankle with early progression.

CONCLUSION: Early rehabilitation following surgical fixation of midshaft femoral fracture focusing on early weight bearing, strengthening of quadriceps and hip abductors and knee ROM may result in decreased impairment, decreased disability and improved functional outcomes

KEYWORDS

intramedullary nailing, rehabilitation, early weight bearing, femoral fractures

INTRODUCTION

Femur is the longest, strongest and heaviest tubular bone in human body.[1] Fractures of the femoral shaft are one of the most common fractures encountered in rehabilitation settings[1]. Long term disability is a major problem in patients of femoral shaft fracture[2]. Fractures of the femoral shaft occur in a bimodal distribution with regard to age.[3] These fractures occur due to high energy injuries in young men or low energy injuries in elderly women.[4] The evaluation and management of patients with femoral shaft fractures have always been the focus of interest and have undergone evolution since past years.[5] Non-surgical management includes skeletal traction followed by cast application. Fractures of the femoral shaft were associated with morbidity before evolution of routine surgical stabilization. Operative treatment includes plate osteosynthesis, external fixation, and intramedullary (IM) nailing.[4,6]

Introduction of Intramedullary Nailing by Kuntschner has improved prevention and management of infection, non-union, fracture shortening and angulation, thereby improving patient survival outcomes postoperatively.[7,8] IM nailing of femur has been the standard procedure with union rates between 95% and 99%[9] and provides stable fixation and permits early mobilization of the patient. Better understandings of the nailing techniques has improved patient mortality and morbidity from pulmonary dysfunction, open wounds and associated multiple other injuries.[1]

Femoral shaft fractures are associated with impairments and functional limitations attributed to soft tissue damage due to trauma during injury, surgery or both.[10] These impairments include hip abductor weakness, quadriceps weakness, and decreased movements at hip, knee pain and decreased walking endurance.[2, 9, 11] Operative treatment allows early patient mobility, decreased pain, minimizes joint stiffness and early functional rehabilitation.[3,7]

Post-operatively early weight bearing has been encouraged and may result in less hospitalization, may facilitate fracture healing and decreased costs of care [12, 13, 14, 15]. An aggressive physical therapy may facilitate long term success, decreasing the impairments leading to functional impairments and disability. The purpose of this case report is to describe an aggressive physiotherapy management following surgical fixation of a femoral shaft fracture.

CASE REPORT

The case was a 22-year old male who met with an accident sustaining an oblique, displaced fracture (Figure 1) of the femoral shaft. Patient was a car driver by profession. Patient underwent a surgery for the right femur and an open reduction and internal fixation using intramedullary nailing (Figure 2) was performed. During the hospital stay, physiotherapy was administered twice a day for 10 days. Outpatient physiotherapy was continued at two weeks post-operatively.

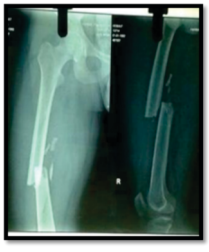

Figure 1: Fracture Shaft Of Right Femur

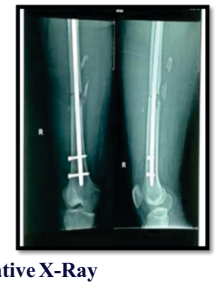

Figure 2: Postoperative X-Ray

The subject participated in the rehabilitation program which focused on range of motion, strength, weight bearing, gait training and functional training. The basic goals were improving strength of quadriceps and hip abductors, range of motion, gait and weight bearing. The progression of exercises was based on evaluation and attainment of these goals.

The rehabilitation started with in-patient physiotherapy from postoperative Day 1. It consisted of isometric exercises for quadriceps

and glutei, ankle pumps, gentle hip and knee ROM exercises. Bed side standing in non-weight bearing was initiated using a walker. The patient was also prescribed a home program following discharge on postoperative day 10. Home program focused on hip, knee, ankle ROM exercises, patellar mobilization and isometric exercises for quadriceps and glutei.

At 2 weeks postoperatively, patient began an out-patient physiotherapy following an initial examination. Exercises focused on hip and knee joint mobility, strengthening and gait training. Active range of motion (AROM) and passive range of motion (PROM) exercises were initiated for hip, knee and ankle. Full knee extension was initiated to prevent knee flexion contracture. Non-weight bearing stretching for hamstrings, gastrocnemius and soleus was performed. Terminal knee extension was achieved using static heel propping stretch. Knee flexion range was achieved using heel slides in supine position. Strengthening exercises to regain active control of knee extensors and hip abductors were performed. Exercises included isometrics, gravity resisted standing hip flexion, abduction and straight leg raise (as tolerated). Non weight bearing ambulation using a walker was progressed.

After 4 weeks postoperatively, patient progressed to weight bearing as tolerated with crutches. Exercises for ROM progressed with patient performing active assisted hip abduction and adduction, heel slides, prone knee bending and terminal knee extension exercises. Strengthening exercises were progressed with focus to achieve good quadriceps and hip abductor strength. Straight leg raise (SLR) was initiated in supine, side-lying and prone position. Hamstring curls and ankle strengthening using light resistance bands was initiated. Patient's ranges were noted as hip flexion 80^0, 30^0 of abduction, 20^0 of medial rotation and 40^0 of lateral rotation. Knee flexion was measured as having 100^0 of flexion and full extension.

Following 8 weeks, the patient progressed to partial weight bearing with 2 crutches. Exercises for improving strength, mobility and weight bearing were progressed. Balance and conditioning exercises were initiated. Progressive resistive exercises for knee extension were initiated with 0.5 kg weight on a quadriceps table. To prevent stress in patellofemoral joint, full knee extension was avoided. Hip and muscle strengthening using elastic resistance was progressed. Each exercise was performed with 3 sets of 10 repetitions. Balance activities included gentle weight-shifting exercises as tolerated by the patient. Bicycling was initiated to improve knee flexion ROM. Progress of the patient was noted regularly with average ROM at hip joint as 110^0 of flexion, 40^0 of abduction, 30^0 of MR and 45^0 of LR.

At 12 weeks postoperatively, partial weight bearing was initiated. Strengthening exercises were progressed with the patient performing knee extension with 1kg weight. Gait training activities involved side-stepping and backward walking as tolerated. Conditioning was progressed to treadmill walking.

After postoperative 4 months, patient continued with home program designed to address residual impairments and functional limitations. The patient achieved full ROM at hip and knee. Progress of the patient was noted after 12 weeks with 115^0 of hip flexion, $45^0$of abduction, 40^0 of MR and 50^0 of LR. Knee ROM was noted with 135^0 of flexion. However, lateral rotation at hip and hip abductors showed residual deficit with a mild Trendelenburg gait. After 5 months patient continued with a home program and returned to work.

DISCUSSION

Femoral shaft fractures are associated with morbidity, mortality and institutionalization [6]. A large number of patients do not return to their preinjury functional state. Impairments and functional limitations persist beyond 1 year after the surgery with less than 50% of the patients able to walk without help and around 40% patients resume independent activities of daily living [16] .The goal of physiotherapy should be to promote rapid and safe return to function and minimizing disability. Intramedullary nailing has become a gold standard and provides early rehabilitation, reduced hospital stay, less chances of infection, nonunion and preoperative complications.[8] The physiotherapy program should aim early weight bearing, muscle strengthening, improve balance, gait training and aerobic conditioning of the patient.

This case involved a young male car driver who sustained fracture of the shaft of femur following a road traffic accident. Patient underwent open reduction internal fixation using intramedullary nail. Postoperatively, the patient was advised for physiotherapy and underwent a rehabilitation program. Inpatient physiotherapy was initiated on Day 1 postoperatively and the patient continued outpatient physiotherapy 2 weeks after surgery. Patient underwent an initial examination, after 2 weeks postoperative which showed limited mobility at hip and knee, decreased muscle strength especially hip abductors and quadriceps, non weight bearing ambulation. Initially, the goals were to improve mobility, muscle strength, improve weight bearing status and gait training. Progress of exercises was dependent on attainment of these goals.

Following femoral fractures, weakness of quadriceps femoris and hip abductors is a common impairment contributing to an altered gait pattern postoperatively.[10, 11, 17] In their study, Bain et al described a significant hip abductor weakness after surgery.[18] Another study demonstrated that 83% of subjects with hip fractures had weaker fractured leg. This asymmetric deficit can complicate weight bearing during gait leading to lateral imbalance resulting in falls [6, 19]. Strengthening of these muscles began immediately and was gradually progressed. Progression was noted using manual muscle testing at regular intervals. Quadriceps strengthening was progressed from isometric to multiple angle isometrics. Dynamic strengthening of quadriceps began at 8 week postoperatively and was gradually progressed with weights.

Passive and active assisted exercises for hip and knee motion were initiated early in the program. Knee extension exercises using heel propping stretch was focused to prevent knee flexion contracture. Along with mobility and strengthening exercises, the patient performed balance and conditioning activities. The goal was early weight bearing and restoration of normal gait pattern[20, 21]. As the rehabilitation progressed, patient improved from non-weight bearing to full weight bearing. Sherrington et al reported improved dynamic balance and functional performance with early weight bearing. Exercises in weight bearing provide better challenge to postural control system.[15] In addition, our patient was advised a home program that focused on improving balance, confidence, self efficacy and better performance of daily activities.

CONCLUSION

This case report highlighted a young male undergoing rehabilitation following intramedullary nailing for femoral shaft fracture. Intramedullary nailing procedure permits early rehabilitation, less hospitalization and reduced chance of complications. Rehabilitation program focusing on early weight bearing, strengthening of hip and knee musculature can help achieve good outcomes and early return to function. However, femoral shaft fractures cases report with a limp while walking as the only residual deficit.

Conflict of Interest – None

REFERENCES

1. Canale, S. T. (2003). Campbell's Operative Orthopaedics 10th edition Mosby.
2. Mitchell, S. L., Stott, D. J., Martin, B. J., & Grant, S. J. (2001). Randomized controlled trial of quadriceps training after proximal femoral fracture. Clinical Rehabilitation, 15(3), 282-290.
3. Mirza, A., & Ellis, T. (2004). Initial management of pelvic and femoral fractures in the multiply injured patient. Critical care clinics, 20(1), 159-170.
4. Wong, P. C. (1967). An epidemiological appraisal of femoral shaft fractures in a mixed Asian population--Singapore. Singapore medical journal, 7(4), 236-239.
5. Heckman, J. D., McQueen, M. M., Ricci, W. M., Tornetta, P., & McKee, M. D. (Eds.). (2015). Rockwood and Green's fractures in adults (pp. 2149-2228). Wolters Kluwer Health.
6. Carneiro, M. B., Alves, D. P. L., & Mercadante, M. T. (2013). Physical therapy in the post-operative of proximal femur fracture in elderly: Literature review. Acta ortopedica brasileira, 21(3), 175-178.
7. Brudnicki, J., & Kubicz-Chachurska, M. Rehabilitation in lower extremity fractures treated with intramedullary nailing. Medical Rehabilitation. 2011; 15(2):13-19.
8. Khalid, M., Minhas, M. S., Ansari, I., Mehboob, G., & Baig, N. (2011). Functional outcome of close intramedullary static reamed interlocking nail in femoral shaft fracture. Pak J Surg, 27(2), 100-104.
9. Helmy, N., Jando, V. T., Lu, T., Chan, H., & O'brien, P. J. (2008). Muscle function and functional outcome following standard antegrade reamed intramedullary nailing of isolated femoral shaft fractures. Journal of orthopaedic trauma, 22(1), 10-15.
10. Hennrikus, W. L., Kasser, J. R., Rand, F., Millis, M. B., & Richards, K. M. (1993). The function of the quadriceps muscle after a fracture of the femur in patients who are less than seventeen years old. JBJS, 75(4), 508-513.
11. Kapp, W., Lindsey, R. W., Noble, P. C., Rudersdorf, T., & Henry, P. (2000). Long-term residual musculoskeletal deficits after femoral shaft fractures treated with intramedullary nailing. Journal of Trauma and Acute Care Surgery, 49(3), 446-449.
12. Paterno, M. V., Archdeacon, M. T., Ford, K. R., Galvin, D., & Hewett, T. E. (2006). Early rehabilitation following surgical fixation of a femoral shaft fracture. Physical therapy, 86(4), 558-572.
13. Arazi, M., Ögün, T. C., Oktar, M. N., Memik, R., & Kutlu, A. (2001). Early weight-

bearing after statically locked reamed intramedullary nailing of comminuted femoral fractures: is it a safe procedure? Journal of Trauma and Acute Care Surgery, 50(4), 711-716.
14. Brumback, R. J., Toal, T. R., Murphy-Zane, M. S., Novak, V. P., & Belkoff, S. M. (1999). Immediate weight-bearing after treatment of a comminuted fracture of the femoral shaft with a statically locked intramedullary nail. JBJS, 81(11), 1538-44.
15. Sherrington, C., Lord, S. R., & Herbert, R. D. (2004). A randomized controlled trial of weight-bearing versus non-weight-bearing exercise for improving physical ability after usual care for hip fracture1. Archives of physical medicine and rehabilitation, 85(5), 710-716.
16. Mendelsohn, M. E., Overend, T. J., Connelly, D. M., & Petrella, R. J. (2008). Improvement in aerobic fitness during rehabilitation after hip fracture. Archives of physical medicine and rehabilitation, 89(4), 609-617.
17. Mira, A. J., Markley, K. I. T. T. Y., & Greer 3rd, R. B. (1980). A critical analysis of quadriceps function after femoral shaft fracture in adults. JBJS, 62(1), 61-67.
18. Bain, G. I., Zacest, A. C., Paterson, D. C., Middleton, J., & Pohl, A. P. (1997). Abduction strength following intramedullary nailing of the femur. Journal of orthopaedic trauma, 11(2), 93-97.
19. Portegijs, E., Kallinen, M., Rantanen, T., Heinonen, A., Sihvonen, S., Alen, M. (2008). Effects of resistance training on lower-extremity impairments in older people with hip fracture. Archives of physical medicine and rehabilitation, 89(9), 1667-1674.
20. Oldmeadow, L. B., Edwards, E. R., Kimmel, L. A., Kipen, E., Robertson, V. J., & Bailey, M. J. (2006). No rest for the wounded: early ambulation after hip surgery accelerates recovery. ANZ journal of surgery, 76(7), 607-611.
21. Moseley, A. M., Sherrington, C., Lord, S. R., Barraclough, E., St George, R. J., & Cameron, I. D. (2008). Mobility training after hip fracture: a randomized controlled trial. Age and ageing, 38(1), 74-80.