Revision of total hip replacement surgery in elderly patient and its recovery based on periprosthetic fracture rehabilitation

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ABSTRACT
Introduction: Slip and fall accidents are associated with 87% of hip fractures and elderly people (Soangra and Lockhart, 2017). Factors such as muscle weakness, impaired postural control and balance are associated with falls in older people. Falls causes reduced independence, function, mobility, confidence in mobility, and quality of life (Hill et al., 2016). Patients with periprosthetic fractures...
are typically elderly, frail and have osteoporosis. It has advantages of early mobilization, reduced hospital stay and reduction in complications such as mal-union and non-union (Marsland and Mears, 2012). Case: A 72-year-old male shopkeeper with right-hand dominance complains that day-to-day tasks such as sitting cross-legged, squatting is difficult. He had a slip and fall back 2 years in the toilet on the left side and sustained injuries to the left arm and hip. Investigations revealed dislocation and loosing of prosthesis of left hip, hence revision surgery was done where bipolar prosthesis was removed and cemented total hip arthroplasty was done where a midshaft femur fracture of same side was found. 7 screw plating proved to be insufficient and unstable, and came out of its place. An open reduction internal fixation was done with trochanteric bridge plating, screws and 4 titanium banding cable-2 at the trochanter in April 2020 and was given open knee brace. Conclusion: In conclusion, this case report demonstrates that patient with periprosthetic fracture with revision total hip replacement and revision surgery for displaced midshaft implant. Patient was able to resume activates of daily living and grooming on his own.

Keywords: Total hip replacement, rehabilitation, Periprosthetic Fracture, implant, Bridge Plating

1. INTRODUCTION

Over 30% of elderly persons living in the community above the age of 65 are inclined to fall annually (Wang et al., 2019). Most of such fractures caused by a combination of age-related events like bone loss and trauma (Subash et al., 2017). Slip and fall accidents are associated with 87% of hip fractures and elderly people (Soangra and Lockhart, 2017). Factors such as muscle weakness, impaired postural control and balance reducing their independence, function, mobility, confidence in mobility and quality of life (Hill et al., 2016). Hip replacement is a widely used for femoral neck fractures for the elderly population. Hemiarthroplasty has its own risks, such as higher acetabular erosion and protrusion acetabuli, which involve a revision operation at a later. Total hip arthroplasty is an effective alternative in 60 year and above because it is the salvage procedure in failed internal fixation and hemiarthroplasty (Subash et al., 2017).

Periprosthetic fractures of the femur pose difficulties like low bone density in minimal distal bone stock available for fixation in supracondylar fractures and pre-existing implants that hinder fracture repair (Page and Leighton, 2019). Patients with periprosthetic fractures are typically elderly, frail and have osteoporosis (Marsland and Mears, 2012). Elderly patients with hip fractures, early mobilization and full weight bearing improves the functional postoperative outcome (Smith et al., 2016). The goal of rehabilitation is best and most efficient physical and social recovery, self-sufficiency and a return to daily activities such as extremities are safe walking and safe transfers. In addition to orthopedic rehabilitation, cardiopulmonary fitness and ADL training (daily life of activities) are always reinforced, and it is also necessary to prevent secondary complications. Rehabilitation after periprosthetic lower extremity fractures activity depends on the type of Fracture, surgical care, postoperative resilience and the general condition of the patient (Schmitt-Sody and Valle, 2016).

2. PATIENT INFORMATION

A 72-year-old male shopkeeper with right-hand dominance complains difficulties in day-to-day tasks. He has history of hypertension for 5 years, and has been a chronic alcoholic for 7 years. Patient had a slip and fall back 2 years in the toilet on the left side and sustained injuries to the left arm and hip. He was admitted to a private hospital where all investigations had been carried out. Because of the alcohol withdrawal symptoms this operation planned for fracture of proximal 1/3rd humerus and hip was delayed. Following 8 days, patient’s relatives bought him at Acharya Vinobha Bhave Rural Hospital (AVBRH), DMIMS (DU) Sawangi Meghe, Wardha, Maharashtra for further treatment. In February 2018 he was managed with Open Reduction and Internal fixation (ORIF) for femur hemiarthroplasty and ORIF with humeral interlock nailing for humerus on left side. By the end of 2018, he experienced pain in operated shoulder along with restricted movements. Pain arised due to non-union of fracture segments and was operated for the same. Implant was removed and ORIF (7 hole philos plate fixed with locking screws and cortical screw) with plate osteosynthesis for proximal humerus was done for which bone graft was taken from right iliac crest. In March 2020, patient experienced insidious and gradual pain over left hip along with difficulty in activities of daily living such as cross leg sitting. Investigations revealed dislocation and loosing of prosthesis of left hip, hence revision surgery was done where bipolar prosthesis was removed and cemented total hip arthroplasty was done. There occurred a Vancouver type B1 fracture during insertion of the femoral stem for which plating was done. The 7 screw plating proved to be insufficient and unstable and came out of its place. He was indicated for another surgery, but due to COVID-19 lockdown the prosthesis required was not available and hence was on proximal tibial skeletal traction was put on a Bohler Braun splint with 6 kgs weights for pain relief and maintaining the position of...
the fracture. As soon as the prosthesis was available an ORIF was done with trochanteric bridge plating, screws and 4 titanium banding cable-2 at the trochanter in April 2020 and was given open knee brace (fig 1 -12).

3. CLINICAL FINDINGS
Patient was examined in supine lying position with both shoulders at same level. On inspection, patient keeps left leg abducted and slightly eternally rotated, knee extended with open knee brace on, ankle in neutral. Presence of swelling on left hip and operative site. On palpation the local temperature was raised and oedema was non pitting type. No loss of superficial sensations (light touch, pin prick and temperature) at left lower extremity was found.

Fig:- 1

Fig:- 2

Fig:- 3

Fig:- 4

Fig:-1,2,3,4:- Plates and screws used for periprosthetic fracture fixation

(Bridge plating)
Fig: - 5 After total hip replacement A-P view

Fig: - 6 Lateral View

Fig: - 7 Periprosthetic fracture

Fig: - 8 Displaced periprosthetic fracture
Fig. 9, 10 Proximal tibial skeletal traction was put on a Bohler Braun splint with 6 kgs weights A-P and lateral view.

Fig. 11 Total hip replacement with periprosthetic fracture fixed (Bridge Plating)
Figure 12 History

Medical Treatment
Total hip replacement was done where bipolar prosthesis was removed and cemented total hip arthroplasty was done where a mid-shaft femur fracture of same side was found and stabilized with plating. The 7 screw plating proved to be insufficient and unstable, and came out of its place. He was indicated for another surgery, but due unavailability of prosthesis required, was on skeletal traction applied to stabilizes. Inability operate due to inavaibility of prosthesis due to COVID-19 lockdown.

Operated for Femur fracture skeletal traction, plating removal and ORIEF trochanteric bridge plating, screws and 4 titanium banding cable-2 at the trochanter and Open knee brace post opp

Referred to Physiotherapy for further management.
traction. As soon as the prosthesis was available an ORIF was done with trochanteric bridge plating, screws and 4 titanium banding cable-2 at the trochanter and was given open knee brace.

**Therapeutic Management**

**Goals**

**Pre-Operative**

The short term goal was to prevent respiratory complications, reduce pain and oedema, maintain and increase joint range of motion and strength of unaffected limbs.

The long term goal was to prevent respiratory complications, reduce pain and oedema, and increase joint range of motion and strength.

**Post-Operative**

The short term goals were to prevent respiratory complications, reduce pain and oedema, maintain and increase joint range of motion (table 2) and strength (table 1), promote early mobility, avoid pressure sores, encourage walking (non-weight bearing), and independent ADL activities.

The short term goals were to reduce pain, swelling, increase joint range of motion and strength, promote walking, gait training, balance, independent ADL activities and ergonomic reduction (Paterno et al., 2006; Paterno and Archdeacon, 2009; Schmitt-Sody and Valle, 2016).

**Table 1** Isometric Strength

<table>
<thead>
<tr>
<th>Muscles</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexors</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Extensors</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Abductors</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Adductors</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Knee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexors</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Extensors</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Ankle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plantar Flexors</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Doris Flexors</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Invertors</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Evertors</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
</table>

**Table 2** Range of Motion

<table>
<thead>
<tr>
<th>Joint</th>
<th>Active</th>
<th>Passive</th>
<th>Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td>NA</td>
<td>NA</td>
<td>Unable to perform due to pain</td>
</tr>
<tr>
<td>Extension</td>
<td>NA</td>
<td>NA</td>
<td>Unable to perform due to pain</td>
</tr>
<tr>
<td>Abduction</td>
<td>NA</td>
<td>NA</td>
<td>Unable to perform due to pain</td>
</tr>
<tr>
<td>Adduction</td>
<td>NA</td>
<td>NA</td>
<td>Unable to perform due to pain</td>
</tr>
<tr>
<td>Knee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td>NA</td>
<td>NA</td>
<td>Unable to perform due to pain</td>
</tr>
<tr>
<td>Extension</td>
<td>NA</td>
<td>NA</td>
<td>Unable to perform due to pain</td>
</tr>
<tr>
<td>Ankle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plantar Flexion</td>
<td>0-45°</td>
<td>0-45°</td>
<td>NA</td>
</tr>
<tr>
<td>Doris Flexion</td>
<td>0-15°</td>
<td>0-15°</td>
<td>NA</td>
</tr>
<tr>
<td>Inversion</td>
<td>0-30°</td>
<td>0-30°</td>
<td>NA</td>
</tr>
<tr>
<td>Eversion</td>
<td>0-20°</td>
<td>0-20°</td>
<td>NA</td>
</tr>
</tbody>
</table>
**Figure 13** Rehabilitation

**Management**

**Pre-Operative Management**

In mid-thigh area cryotherapy was used to ease pain. Relaxation techniques, deep breathing and spirometry avoid problems in the respiratory system. Ankle toe movement to prevent oedema. Static quads, static hams and static glutei preserving the power of quadriceps, hamstring and glutes. Half bridging to sustain core power (using unaffected leg and both elbows). Active movements for unaffected limbs to maintain their strength (fig. 13).
Post-Operative Management

Week - 1

Day - 1 - 2
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, static quads, hams and glutei, active movements for unaffected limbs were continued along with proper positioning and bed mobility was done to reduce risk of pressure sores.

Day - 3 - 4
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, static quads, hams and glutei, half bridging, active movements for unaffected limbs, proper positioning were continued along with active assisted SLR (0-5°) to maintain quadriceps and hamstring strength, to reduce joint stiffness and increase range, active assisted hip abduction (0-5°), adduction (5°-0) to maintain hip abductor and adductor strength, to reduce joint stiffness and increase range. Heel slides (0-5°) to maintain quadriceps and hamstring strength, to reduce joint stiffness and increase range.

Day - 5 - 7
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, walking with walker (non-weight bearing), static quads, hams and glutei, half bridging, active movements for unaffected limbs were continued. Ranges of operated leg were increased to active assisted SLR (0-10°), active assisted hip abduction (0-10°), adduction (10°-0) to maintain hip abductor and adductor strength, to reduce joint stiffness and increase range, heel slides (0-10°)

Week - 2
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, walking with walker (non-weight bearing), static quads, hams and glutei, half bridging, active movements for unaffected limbs were continued. Active assisted movements were progressed to active SLR (0-15°) to maintain quadriceps and hamstring strength, to reduce joint stiffness and increase range, active hip abduction (0-15°), adduction (10°-0) to maintain hip abductor and adductor strength, to reduce joint stiffness and increase range, heel slides (0-15°) to maintain quadriceps and hamstring strength, to reduce joint stiffness and increase range, long sitting with or without bed support to reduce joint stiffness and promote mobility

Week - 2 - 4
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, walking with walker (non-weight bearing), static quads, hams and glutei, half bridging, active movements for unaffected limbs were continued. Active movements were progressed to resisted exercises of mild power in active SLR (0-30°), prone SLR (0-10°), active side SLR (0-10°), heel slides (0-30°), active assisted dynamic quadriceps (0-30°). Long sitting and bed side sitting with or without bed support were encouraged. Bed side standing with walker and walking with walker (non-weight bearing) to improve balance, reduce fear of fall, gain confidence and strength

Week - 4 - 8
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, walking with walker (non-weight bearing), static quads, hams and glutei, bridging, active movements for unaffected limbs were continued. Resisted exercises were done with increased range of motion such as SLR (0-45°), prone SLR (0-30°), side SLR (0-10°), heel slides (0-45°), dynamic quadriceps (0-45°). Standing and walking with walker (partial weight bearing) was encouraged.

Weeks - 8 - 12
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, walking with walker (non-weight bearing), static quads, hams and glutei, bridging, active movements for unaffected limbs were continued. Resisted exercises were done with moderated resistance with increased range of motion such as SLR (0-90°), prone SLR (0-30°) with resistance, side SLR (0-30°), heel slides (0-90°), dynamic quadriceps (0-90°). Standing and walking with walker (partial weight bearing) encouraged.

Weeks - 12 - 16
Cryotherapy, relaxation techniques, deep breathing, spirometry ankle toe movement, walking with walker (non-weight bearing), static quads, hams and glutei, bridging, active movements for unaffected limbs were continued. Resisted exercises were done with
mobilization were set, starting from mild exercises. Inception and physical mobilization of elderly hip and full weight bearing walking with walker to prevent reoccurrence of fall due to weakness and lack of balance.

**Home programme**
Patient was asked to continue all resisted exercises, gait training exercises, and full weight bearing walking with walker to prevent reoccurrence of fall due to weakness and lack of balance.

**Limitations**
Unavailability of proper prosthesis lead to usage of skeletal traction wherein knee movements were restricted leading to stiffness of the knee joint. The rehabilitation goals vary according to severity of procedure, age of patient as the procedure is not common.

4. DISCUSSION
In this case, patient represented with insidious and gradual pain in left hip which was then operated twice and lastly was operated with ORIF with trochanteric bridge plating. After referring to physiotherapy, patient complains of pain and swelling on operated left hip. A successful plan of care was made following a clinical evaluation. Goals for rehabilitation were set, starting from mild exercises to strengthening and full weight bearing ambulation with walker. All the exercises were performed with each one three times a day 10 sets; ice packs were applied around the patient’s hips to reduce the exercise caused discomfort during the therapy session. There are literatures that show the effects of hip replacement recovery for patients, but research on acute treatment and routine treatments are missing.

Explained precautions were: Stop sitting on low-floor chairs; sitting cross legs; keeping both legs apart to avoid any dislocation to the hips; stop ascending stairs. There by patients can have benefited with these therapy protocols with efficient results and a shorter-term quality of life. Also, patient was scheduled to engage in a fast-track community plan with a relative. It seems plausible that motivation is highest in the early phase; during which, the patients experience pain relief and are on sick leave from work. Despite the motivation factor, it is crucial to initiate training of muscle strength immediately after surgery because of the muscle atrophy in the first weeks documented by Suetta et al. (2004). A non-randomised, controlled trial by Sashika et al. (1996) showed that a six-week home program including hip range of motion exercises, isometric exercises, and eccentric strengthening increased strength of hip abductors, walking speed, and cadence. Di Monaco et al. (2009) performed a systematic review of controlled trials of physical exercise programs after total hip replacement, which also supported the usefulness of rehabilitation from late phase (>8wks post-operative).

In a study performed by Wade Smith et al. (2016) shows, it is safe and effective, with an emphasis on early weight bearing and ambulation. Early intervention has been shown to improve mortality, morbidity and promote functional rehabilitation of elderly hip fractures. Limiting weight-bearing status after surgery complicates the recovery period by prolonging dependence on walking aids and the patient’s need to remain in an extended care facility. Early weight bearing in distal femoral peri-prosthetic fractures will promote effective regeneration while retaining low complication levels by requiring rapid complete. Schmitt-Sody et al. (2016) emphasized on pain reduction, correct positioning, edema reduction, pressure ulcers and pneumonia prophylaxis. Strenuous need transitions out of bed from where the patient talked and educated to sit and stand under partial load in first phase of rehabilitation.

In study conducted by Mark V Paterno et al. (2006) and Mark V. Paterno et al. (2009) Phase I exercises focused on joint mobility in the hip and knee, non-weight-bearing strengthening, and weight-bearing progression during gait. The patient was expected to show an outpatient capacity of 50% of total weight bearing, good quadriceps femoris muscle contraction, and good muscle tension of the hip abductor before moving to phase II. Throughout Phase II, the work outs concentrated on the strength of the lower extreme with complete weight-bearing tasks throughout addition to enhancing mobility, balance, preconception and physical conditions.

5. CONCLUSION
This case report provides a comprehensive rehabilitation plan that helped relieve pain, edema, increase strength and range of motion post-operatively. In conclusion, this case report demonstrates that patient with Periprosthetic fracture with revision total hip replacement and revision surgery for displaced midshaft implant. Patient was able to resume activates of daily living and independent ambulation with walker.
Informed consent
Informed consent was obtained from patient included in the study.

Author’s contribution
All authors contributed equally for the study.

Funding
The study received no external funding.

Conflicts of interest
The authors declare no conflict of interests.

REFERENCE