

## Original Article

# Intertrochanteric fractures in patients with lower limb amputation

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**Abstract:** Fracture of the residual limb in an amputee is uncommon. Intertrochanteric fractures of patients who had lower limb amputation have been studied only in several case reports; however clinical studies are lacking. We performed a retrospective clinical study to assess if these patients could return to their pre-fracture activity level after dynamic hip screw (DHS) fixation of their intertrochanteric fractures. Our hypothesis is that DHS fixation of intertrochanteric fractures in these patients would give good results with fracture union and could help to return to the previous activity level. We retrospectively reviewed data of the 12 patients (between the period of January 2006 and March 2013) who underwent DHS fixation of an intertrochanteric fracture on the ipsilateral side of a major lower limb amputation (above knee or below knee amputations). Age, gender, amputation level, amputation reason, time since amputation, mechanism of injury at the time of fracture, operation time, length of hospital stay, time to bone union and activity level were documented. Patient's activity level after one year of operation and union time were evaluated as primary outcomes. During the study period, 12 patients were included with seven (58.3%) male and five (41.7%) female. Mean age at the time of fracture was 57.6 years (range 48 to 72 years). All of the fractures were classified according to AO/OTA as 31A1. There were four patients (33.3%) with above knee and eight patients (66.7%) with below knee amputation. Mean time to bony union in twelve patients was 18 weeks (range 8 to 24 weeks). Ninety-two percent of these patients returned to pre-fracture activity level. There were no implant failure or nonunion at the minimum two-year follow-up period. DHS fixation of intertrochanteric hip fractures in patients with ipsilateral amputated limb provides good results of returning pre-fracture activity levels. Bone union time found to be similar in these patients when compared with patients with a normal limb.

**Keywords:** Fracture in amputate, activity level, intertrochanteric fracture, union, stump

## Introduction

Intertrochanteric fractures are one of the common health problems; the incidence of these fractures has increased in recent years as life expectancy increased [1]. These common fractures may result in impaired mobility and loss of independence [2]. Fracture rates of previously amputated patients have been reported between 2.35% and 3%. The majority of these fractures occur in distal femur [3, 4]. Hip fracture rate in this patient population is undetermined. Treatment of these fractures needs special attention because of their morbidity. Intertrochanteric fractures of patients who had previous lower limb amputation have been studied only in case reports [5-7]. These cases mainly described the difficulty of patient

positioning. Treatment of hip fractures is complex and challenging even in a non-amputee patient. Patients who had an amputation of their lower extremity may have various problems such as osteoporosis and lowered activity levels. The quality of life in these patients is significantly associated with mobility [4]. It is unknown if these patients could return to their previous activity level after surgical treatment of intertrochanteric fractures. Also, it is not clear if union of these fractures differs from non-amputees.

The purpose of the study was to investigate if patients with lower limb amputation could return to their previous activity level after the surgical intervention of intertrochanteric hip fracture. We hypothesized that dynamic hip

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screw fixation of intertrochanteric fractures in these patients had good outcomes with uneventful fracture union and ability to return to the previous activity level.

### Material and methods

Between January 2006 and March 2013, patients who had a fracture at the ipsilateral side of a major limb amputation (above knee or below knee amputations) were identified from computerized database of hospital. The medical records of all identified patients were retrospectively reviewed. The patients, who underwent closed reduction and dynamic hip screw (DHS) operation for intertrochanteric fracture on the ipsilateral amputated limb, were identified for the study population. Patients who were treated conservatively (two patients), denied surgical intervention (one patient), and died during the follow up period (one patient) were excluded from the study. At last 12 patients who were treated by DHS for an intertrochanteric fracture were included in the study. All fractures included in the study were classified according to AO/OTA classification as 31A1. Similar operation technique and approach used for all patients. After administration of anesthesia, each patient was positioned supine on the operation table. Reduction achieved by traction and internal rotation of the injured extremity with the aid of assistant surgeon. We did not use traction table for these patients. Adequate positioning obtained to allow imaging of the hip fracture site with an image intensifier. A longitudinal incision was made through the skin from just distal to the greater trochanter to the fascia layer. A longitudinal split was then created in the line of the fascia lata and exposure of the vastus lateralis was obtained. The vastus lateralis split in line with its fibers and was retracted to expose the femoral shaft distal to the fracture site. A variable angled guide allowed placement of a 2.5-mm guide wire centrally in the femoral head, confirmed on anterior-posterior (AP) and lateral imaging. After measuring the length of the screw of the guide wire, the trochanteric area and femoral neck reamed. The lag screw of the appropriate length is screwed into position after tapping. Fluoroscopy used to confirm appropriate positioning and a satisfactory tip-apex distance in both the AP and lateral views. The appropriate sized plate is then fixed onto the femoral shaft with 4.5 mm cortex screws.

Same postoperative rehabilitation protocol was used for all patients. Physiotherapy was started on postoperative day one. Weight bearing with prosthesis was allowed as tolerated immediately. Consecutively, weight bearing was increased according to the progress of bone union.

Data of the patients include age, gender, amputation level, amputation reason, time since amputation, mechanism of injury, operation length, length of hospital stay, time to bone union and activity score. The patients were followed by clinical examination and radiographic assessment after the operation. Follow-up visits were conducted at the 2nd and 4th weeks and afterward every three months for two years. Patients were evaluated with clinical examination and imaging (anterioposterior and lateral hip radiographs) during each follow-up visit. Bony union was defined as evidence of bridging callus or cortical continuity involving at least two cortices in hip AP and lateral views [8].

At one-year follow-up, patients were questioned regarding the use of cane or crutches, use of the prosthesis and their ability to do their daily activities. The postoperative clinical outcome was evaluated by the recovery rates to pre-fracture activity status at 1-year after surgery. Regarding the activity scale patients who returned to previous activity levels rated as excellent. Patients who needed a cane or crutches for walking rated as good, patients who couldn't regain their daily activities even with additional supports rated as fair results. Patients who had become non-ambulatory rated as poor. Radiographs were evaluated for signs of nonunion, infection and implant failure till second year postoperatively. **Figures 1 and 2** show a sample case.

### Results

All patients underwent closed reduction and dynamic hip screw fixation. There were 7 (58.3%) male and 5 (41.7%) female patients. Mean age at the time of fracture was 57.6 years (range 48 to 72 years). All of the fractures were classified according to AO/OTA as 31A1. There were four (33.3%) above knee and eight (66.7%) below knee amputated patients. Mean time since amputation was 89.1 months (range 56 to 220 months). Causes of

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**Figure 1.** Preoperative pelvis radiography of the patient. Left intertrochanteric fracture at the ipsilateral side of above knee amputation.



**Figure 2.** Postoperative second year pelvis radiography of the patient showing the DHS well positioned and fracture united.

amputation were: Diabetes mellitus in eight patients, peripheral vascular disease in 3 patients and trauma in one patient.

Mean time to bony union was 18 weeks (range 8 to 24 weeks). All patients were available for 1 year follow-up examination; 8 patients returned to previous functional statuses rated as excel-

lent result, 3 patients needed a can for walking rated as good. One patient couldn't return his daily activities and rated as fair result. None of patients became non-ambulatory. Three patients were employees before intertrochanteric fractures. (A school teacher, a secretary and a tailor). Two of these patients returned their job and one (school teacher) who needed additional support retired from his job.

Mean operative time was 40.1 minutes (range 20 to 56 min). Postoperative radiographs taken after surgery showed that acceptable reduction was achieved in all 12 cases. Mean hospitalization time was 12 days (range 7-17 days) and postoperative complications during the hospitalization occurred in two cases; one hematoma formation and one continued wound drainage. Hematoma resolved spontaneously and the wound drainage resolved after debridement and antibiotherapy for 3 weeks. No intraoperative complications seen in these patients. Pressure sores or venous thromboembolism were not detected in any patients. Details of data in patient population were documented on **Table 1**.

### Discussion

Hip fractures in patients with previous ipsilateral limb amputation may create a dilemma for treating surgeon as to whether the patient will be able to return preoperative activity level. In this study, we have shown that 92% of patients can return to their previous activity level after DHS fixation of intertrochanteric fracture on the same side of limb amputation. All fractures were united at a mean time of 18 weeks.

There were an estimated 1.6 million individuals with an amputated limb in 2005; these estimations are expected to expand more than twofold to 3.6 million such individuals by the year 2050 [9]. Lower limb amputation is associated with significant morbidity and disability. Previous studies showed only about 55-79% of patients returned to same activity level after major limb amputations [10, 11]. It is a vital condition to maintain health and avoid injury to the remaining leg in these patients. Also, it is important to keep hardly remained activity level after amputation. Altered body mechanism after having an amputation for a long time have some effects on the bony structure of residual limb one with much importance

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**Table 1.** Data on the patients with intertrochanteric fractures on the ipsilateral amputated extremity

Patient no	Age	Gender	Amputation level	Cause of amputation	Time since amputation (months)	Mechanism of injury	Operation time (min)	Length of hospital stay (day)	Follow up activity score	Time to bone union (weeks)
1	56	Female	Above Knee	Peripheral vascular disease	56	Fall from stairs	48	9	Excellent	8
2	48	Female	Below Knee	Diabetes Mellitus	59	Simple fall	28	8	Excellent	22
3	62	Female	Above Knee	Diabetes Mellitus	82	Simple fall	20	14	Excellent	18
4	52	Female	Above Knee	Diabetes Mellitus	96	Simple fall	50	12	Good	20
5	58	Male	Below Knee	Trauma	220	Simple fall	50	13	Good	18
6	54	Female	Below Knee	Diabetes Mellitus	72	Simple fall	42	16	Excellent	21
7	64	Male	Below Knee	Peripheral vascular disease	83	During physical therapy	56	17	Fair	24
8	55	Male	Below Knee	Diabetes Mellitus	66	Simple fall	32	15	Good	19
9	49	Male	Above Knee	Peripheral vascular disease	58	Simple fall	28	12	Excellent	14
10	72	Male	Below Knee	Diabetes Mellitus	112	Simple fall	44	8	Excellent	17
11	57	Male	Below Knee	Diabetes Mellitus	61	Fall from stairs	38	7	Excellent	15
12	64	Male	Below Knee	Diabetes Mellitus	104	Simple fall	46	13	Excellent	21

is osteoporosis. Muscle atrophy and osteoporosis increase the risk of fracture with minimal trauma. Some patients with the previously amputated limb may refuse to use prosthesis this may lead the unweight bearing of the amputated limb and excessive osteoporosis on the stump. Since authors concluded similar concerns; as decreased vertical loading on the residual limb may cause disuse atrophy and, thus, osteoporosis of the residual femur [12]. Fifty two percent of the patients with lower limb amputation have reported at least one fall in the previous year [13]. Fracture rates of these patients have been reported 2.35% and 3% [3, 4]. Hip fractures are important in these patients because morbidity of these fractures is high. As far as our knowledge there is not any study reporting on activity levels of these patients after suffering intertrochanteric hip fracture surgery. In our findings majority (92%) of these patients return to previous activity level.

Authors submit that a fracture in an amputated leg can behave like a fracture in a normal extremity [14]. Mean union time reported after DHS fixation of intertrochanteric fracture is around 16 to 20 weeks in current literature [15]. Also, we had the mean time of union as 18 weeks in our patient population. These findings suggest that there is no difference according to union time of these fractures between patients with amputated or normal limb.

Bowker et al. [16] evaluated a series of patients with fractures of the lower limbs which had prior amputations. There were nine intertrochanteric fractures on below-knee amputees and 15 intertrochanteric fractures on above knee amputees. Their treatment method was mostly conservative with non-weight bearing or with a light weight-cast. They reported 97% of the patients with an amputation below the knee and 82% of the patients with amputation above the knee-resumed use of prosthesis after the treatment of their fractures. Also, the proportion of patients requiring the use of supplemental aids (cane or crutches) increased from 26 to 35 percent in their case series. In our cases, all of the patients resumed the use of their prosthesis. Only one patient required additional support after treatment.

Mirdad et al. [17] reported three cases. The one with subtrochanteric fracture treated with

conservative methods his fracture healed but became mostly wheelchair-bound. Another patient who had trans tibial amputation sustained a supracondylar femur fracture treated with conservative matters. Other patient of previous transfemoral amputation with intertrochanteric fracture operated on DHS. Authors reported an uneventful postoperative recovery in this patient. The patient did not use any prosthesis preoperatively or postoperatively.

Three case reports of intertrochanteric hip fractures in patients with ipsilateral amputated limb described technical difficulties of patient positioning [5-7]. We did not use a traction table for our patients and traction and rotation was maintained with the assistant surgeon in our patients. We did not observe any technical difficulty on these patients' by this simple procedure.

To our knowledge, the present study is the only study that presents results of hip fracture fixation in this patient population. Limitations of this study include its retrospective nature and using patient statements on activity levels determination.

### Conclusion

In conclusion, DHS fixation of intertrochanteric hip fractures in patients with ipsilateral amputated limb has good results of returning previous pre-fracture activity levels. Bone union time is similar in these patients comparing patients with the normal limb.

### Disclosure of conflict of interest

None.

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