

TOTAL HIP ARTHROPLASTY AND REHABILITATION IN AMBULATORY LOWER EXTREMITY AMPUTEES—A CASE SERIES

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INTRODUCTION

A high incidence of osteoarthritis in the hip and knee joints has been reported in lower limb below-knee amputees.¹ However, there is limited literature about the outcomes and role of total hip arthroplasty (THA) as a surgical option for amputee patients. Salai et al.² reported on five below-knee amputee patients who were treated with total hip arthroplasty for displaced subcapital femoral head fractures. Their results suggest that total hip arthroplasty in below-knee amputee patients may prevent functional deterioration and preserve functional capacity.²

Nevertheless, patients with lower extremity amputations in need of contralateral or ipsilateral total hip arthroplasty present with additional challenges with regard to their acute postoperative care, and need a modified rehabilitation program. The purpose of this brief case series is to describe four patients with lower extremity amputations who subsequently underwent total hip arthroplasty. We also review the rehabilitation challenges that these patients present.

MATERIALS AND METHODS

To identify patients who met the criteria for our study, a cross-reference of diagnosis and procedure codes was used against the hospital's patient database. Patients with lower extremity amputations who underwent total hip arthroplasty were identified. Retrospective chart reviews were performed on four different patients who had lower extremity amputations and who later underwent total hip arthroplasty at our institution. Procedures were performed between 1998 and 2001 on patients ranging in age from 39 to 79 years of age.

Two patients had ipsilateral total hip arthroplasties with respect to the amputated limb (in one below-knee amputee and one Symes-level amputee), one had a contralateral total hip arthroplasty, and one patient with bilateral below-knee amputations had right total hip arthroplasty. Two patients underwent total hip arthroplasty for osteoarthritis, one for post-traumatic osteoarthritis after acetabular fracture, and one patient required THA for avascular necrosis. The patient with avascular necrosis had a previous Symes-level amputation, but the other three patients had conventional below-knee amputations. A different surgeon using a posterior approach with regional anesthesia performed each total hip arthroplasty.

Retrospective chart analysis included review of patient demographics, preoperative diagnosis, type and time of amputation, type of prosthesis, radiological examination, length of hospital stay, postoperative physical therapy notes and milestones, and follow-up office visit notes. Achievement of physical therapy milestones was compared against the average for all other patients who underwent total hip arthroplasty surgery during the same time period (1998-2001).

CASE STUDIES

Patient One

The first patient was a 66-year-old woman who had amelia of both fibulae and the lesser toes resulting in a series of operations and eventually, at the age of 20, bilateral below-knee amputations. Forty-six years later, she developed severe osteoarthritis of the right hip and failed conservative treatment. She ultimately underwent a successful right hybrid total hip arthroplasty in 2000. Prior to surgery, she ambulated with a cane two to three blocks, and negotiated stairs in a non-reciprocating manner. On postoperative day number one, she transferred from a supine to a sitting position. On postoperative day number two, she required assistance with her below-knee prostheses, and then was able to ambulate with a walker. On postoperative day number five, she progressed from the walker to Canadian crutches and on postoperative day number six she was discharged to a rehabilitation facility. Seven months postoperatively, she returned to work 40 hours per week. She used a cane only in snowy and icy weather.

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TABLE 1
Summary of Patient Demographics and Physical Therapy Milestones Compared to Hospital Average

PATIENT NUMBER	1	2	3*	4	Non-amputee THA average
Sex	F	M	F	F	
Below Knee Amputee	Bilateral	Left	Left	Right	
Total Hip Arthroplasty	Right	Right	Left	Right	
Time period between Below Knee Amputee & Total Hip Arthroplasty (in years)	46	22	10	0.058	
Total Hip Arthroplasty indication	Osteoarthritis	Osteoarthritis	Avascular necrosis	Failed total hip arthroplasty	
Transfer assisted: postoperative day	1	1	1	Did not	1.4
Ambulation with walker: postoperative day	2	1	1	Achieve	1.2
Ambulation with cane / crutches: postoperative day	5	4	4	PT	4.2 / 4.5
Reciprocation of stairs: postoperative day	-	5	4	goals	4.9
Length of Stay (in days)	6	6	5	15	5.5

*Data after third revision

Patient Two

The second patient was a 79-year-old man who underwent a left below-knee amputation in 1979 for severe peripheral vascular disease. Two years later, he underwent a total hip arthroplasty of the contralateral limb due to debilitating osteoarthritis. Prior to surgery the patient was able to ambulate three to four blocks with a cane. He negotiated stairs in a non-reciprocating manner. On postoperative day number one, he was able to place his contralateral below-knee prosthesis with assistance. He transferred with moderate assistance and was able to ambulate with a walker. By postoperative day number four, he transferred without assistance and progressed from ambulation with a walker to ambulation with two canes. On postoperative day number five, he was able to ascend and descend stairs in a non-reciprocating manner. He was discharged home the next day, on postoperative day number six. His three-month follow-up visit indicated that he was doing well clinically and radiographically and was ambulating with a cane.

Patient Three

The third patient had a congenital dysgenesis of the left femur creating an inequality in leg length. Subsequently, in 1967 she underwent a left Symes amputation. Ten years later, in 1977, she underwent a left total hip arthroplasty for avascular necrosis. A revision was performed in 1983 secondary to a loose acetabular component. In 1993, the patient underwent a second revision,

this time for the femoral component. In 1998, the patient underwent a third revision for a failed femoral component. Prior to admission for the latest revision the patient was able to ambulate half a block with a cane and was able to reciprocate stairs. On postoperative day number one the patient required minimal assistance for transfers and was able to ambulate with a walker after donning her prosthesis. On postoperative days number two and three the patient increased her ambulation with the walker. On postoperative day number four the patient progressed to axillary crutches and was able to negotiate stairs in a non-reciprocating fashion. On postoperative day number five the patient was discharged home with crutches. At her last follow-up, she did not need ambulatory aids.

Patient Four

The fourth patient was a 39-year-old woman with a past medical history significant for congestive heart failure, cerebrovascular accidents, seizures and end-stage renal disease secondary to hypertension. In June of 2000 she had a seizure while having dialysis. She fell and sustained a right acetabular fracture treated nonoperatively. A right heel ulcer with osteomyelitis developed, for which she subsequently underwent below-knee amputation. The patient eventually developed post-traumatic arthritis status post acetabular fracture, and in October 2001 underwent right total hip arthroplasty as treatment for the acetabular fracture. Prior to

Patients ONE THROUGH FOUR Compared to Hospital Average

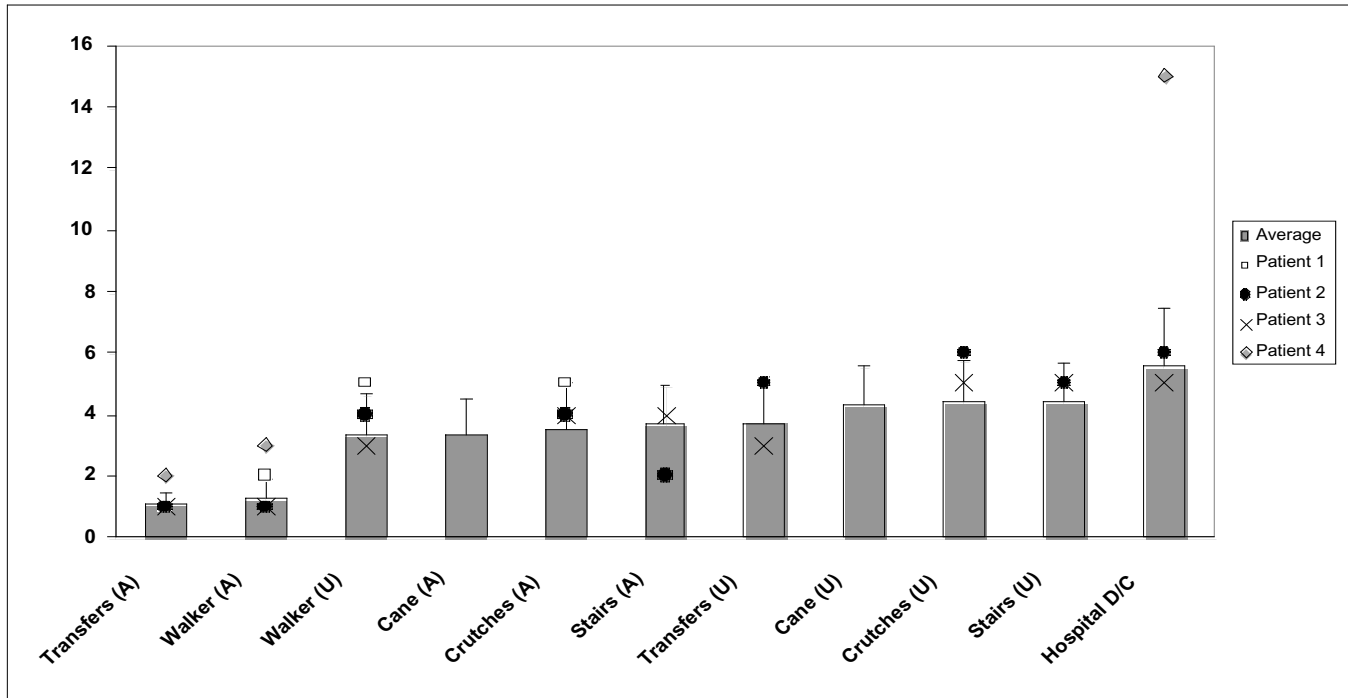


Figure 1. Achievement of physical therapy milestones (i.e. assisted/unassisted transfer into and out of bed, assisted/unassisted ambulation with the appropriate assistive device and the ability to negotiate stairs in a non-reciprocating manner) and total length of stay of patients one through four, compared to the average for total hip replacement patients who underwent surgery from 1998-2001.

THA, the patient was debilitated and wheelchair bound. Since the below-knee amputation was performed only three weeks prior to the total hip arthroplasty, the patient had not yet been fitted for a prosthesis. Although she received physical therapy daily, she was unable to ambulate mainly due to weakness in her left uninvolved leg. On postoperative day three, she was able to stand with the walker and by discharge she stood for a maximum of three minutes. She did not achieve physical therapy goals and was discharged to a rehabilitation facility on postoperative day 15. Three months postoperatively, she was ambulating well with a walker and prosthesis.

The number of days to achieving physical therapy milestones and total length of stay were examined and compared to our institution's physical therapy database. This information is summarized in Table 1 and individually presented in Figure 1.

DISCUSSION

Physical therapy following total hip arthroplasty in patients who have an ipsilateral or contralateral amputation is important to obtain optimal physical function. Patients one, two, and three recovered well compared

to non-amputee patients. The patients were ambulating independently with a cane prior to surgery and this may be correlated with their outcomes. Patient one dangled at the bedside and was able to ambulate with a walker on postoperative day number two, while patients two and three were able to ambulate with a walker on postoperative day number one. Our institution's figures for non-amputee total hip arthroplasty patients from 1998 to 2001 show an average of 1.2 (n=1172) days before ambulation with a walker. Patient one was discharged on postoperative day number six to a rehabilitation facility. Patients two and three were discharged home on postoperative day number five. The average length of stay for a total hip arthroplasty patient at our institution is 5.5 days.

Patient four, unlike the others, was not ambulatory at the time of admission. Her situation was unique in that her below-knee amputation was only three weeks prior to her total hip arthroplasty. She was only able to stand with a walker while in our hospital. Her length of stay was 15 days, approximately ten days greater than our institutional average (see Table 1).

An aggressive inpatient physical therapy regimen has been demonstrated as effective in lower limb amputees.

In particular, Turney et al⁴ demonstrated that below-knee amputees generally gain better mobility than above-knee amputees ($p=0.002$). In an effort to establish guidelines for suitable methods of treatment and expected functional results, Bowker et al⁵ evaluated a series of patients with fractures of the lower limbs, who had prior amputations. The authors concluded that the most important surgical goal in treating this group of patients with either below- or above-knee amputations, was to restore the normal angle between the neck and shaft of the femur. This objective further restores the hip abductor function. In addition, Bowker et al found that after the fracture healed, 97.0 percent of below-knee amputees resumed the use of their prosthesis, however the proportion of patients requiring the use of supplemental aids, i.e. cane or crutches, increased from 26 to 35 percent.⁵ Total hip arthroplasty to treat subcapital fractures of the femoral head has been demonstrated to be effective in below-knee amputees. Salai et al² found that total hip arthroplasty in these patients may prevent functional deterioration and preserve functional capacity.

In amputees undergoing THA, there are important factors to consider. In one of the four patients, the total hip arthroplasty was contralateral to the below-knee amputation. Therefore, the role of the contralateral limb in below-knee amputee gait must be considered. Hurley and McKenney et al⁶ found that below-knee amputation patients demonstrate a lesser degree of limb symmetry during gait than non-amputees. In studies with below-knee amputations, J. Breakey⁷ found that the stance phase in gait was longer in the normal limb and shorter in the amputated limb. Perron et al⁸ found that following total hip arthroplasty, patients had a four-percent decrease in single-limb stance on the surgical side. A possible rationale for why the second patient required more external support (two canes) may be due to decreased single-limb support time bilaterally. In the two patients whose surgeries were ipsilateral, the combination of the below-knee amputation and total hip arthroplasty on the same side may decrease single limb support time even further and explain why the third patient required crutches rather than a cane.

Our study has demonstrated that lower extremity amputee patients present a challenging acute postoperative rehabilitation course status post total hip arthroplasty relative to non-amputee patients. The first six weeks after surgery are critical with respect to enforcing the standard hip precautions. These precautions are important in order to avoid dislocation and are especially critical for amputees while placing and removing their prostheses.

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