Return to Work following occupational injury and Upper Limb Amputation
Submission to *Occupational Medicine*
Mike Craig, Wendy Hill, Kevin Englehart, Anil Adisesh
Key words: amputation, upper limb, rehabilitation, prosthesis, occupation

INTRODUCTION

Upper limb injury can result in loss of function, potentially having social and financial consequences. Although some authors have investigated return to work among people with lower limb amputation (1,2,3), the recent literature is sparse regarding upper limb amputation (ULA). (5-10) The most recent data were published in the 1970s-1990s. The intervening time has seen considerable advancement of prosthesis technology. Employment trends have also shifted towards a service and knowledge-based economy, moving away from physically demanding tasks, in much of the Western world. We considered it worthwhile to update the picture of the return to work process after ULA. The purpose of this study was to estimate the incidence and patterns of return to work after partial or complete ULA. The potential impact of specific demographic and medical factors was also investigated.

METHODS

At a workers' rehabilitation centre, case records of adult (age > 18 years) patients with acquired ULA were selected for inclusion. Exclusion criteria included congenital amputation, and significant comorbid trauma such as a lower-limb amputation. Ethical approval was obtained from both the Workers' Compensation Board and Horizon Health Network (REB 2014-2019). Using manual abstraction from case records, data was collected on independent variables (type of prosthesis used, handedness before amputation, anatomic level of amputation, time to receive prosthesis, age at amputation, and occupational category before amputation). Data for outcome variables (post-amputation work status and occupational category) was also collected. Descriptive statistics were used to analyse the data with the independent samples t-test for comparison of means of continuous data. Similarly, Chi-square tests were performed for categorical independent variables and each categorical outcome variable. Pearson coefficients were calculated for changes in occupational category.

RESULTS

56 case records were identified, 6 of which were excluded due to presence of multiple amputations (n=2), absence of any amputation (n=1), or age < 18 years. This resulted in 50 cases being used for our study cohort.

The mean age at amputation was 36.9 SD 11.2 years. Amputations occurred a mean of 11.6 SD 4.3 years before the study. At the time of this study, 82% of patients (40/49) had made a documented return to work.

Participants who returned to work (mean age 35.2 years, SD 10.4) were statistically significantly younger than participants who did not return to work (mean age 46.1 SD 10.1 years). However, there was no relationship between age and return to work at 1, 2, or 5 years post-injury. Of those who returned to work, they did so after a median of 172 days, range 20 days - 7 years. The time taken to return to work was also negatively correlated with age at amputation (r = -0.332). The swiftness of prosthesis fitting showed no relationship to return to work outcomes. Sample size was insufficient to perform meaningful analyses on the level of amputation, the type of prosthesis, and whether the amputation involved the dominant hand. We examined the association of occupation

before and after amputation. Occupation was coded to the National Occupational Classification (NOC). (4) Table 1 shows the correlation between pre-amputation and post-amputation NOC occupational subclass ($r = 0.527$). With respect to occupation type, low sample sizes precluded analysis against other variables.

DISCUSSION

We studied patients from a population of workers' compensation claimants. We find that they tend to suffer ULA at a young age. Among our patients, 82% eventually returned to work. Those returning were younger than those who did not, and they tended not to switch occupational class. Median time to return to work was 172 days. Previous studies have indicated a large variation in the proportions of subjects who return to work after ULA. This may be due to the heterogeneity between study populations. The largest known study of ULA was also done in a Workers' Compensation population, and revealed 87.5% of 538 patients made a return to work. (5) One cohort of 246 patients with ULA had a mean age of 35 years at time of amputation. While 51% of the patients continued working, only one patient returned to his previous job. Others took different jobs, retired, or were not successful in finding work. (6) The same study found that high-level amputation is associated with a lower rate of return to work. Prosthesis use was also associated with increased return to work. Davidson showed that ULA patients are less able to return to unskilled work, and are also more vulnerable to unemployment. (7) Another study done in the general population noted that the employment rate pre-and-post amputation was similar (78% vs. 75%), however approximately 1/3 of the patients changed jobs. This study also found that patients younger than age 50 were more likely to return to work, which is consistent with our findings. (8) Other case series reported return to work rates of 43% to 58%. (9,10)

Our study has several limitations. First, the population was limited to those injured at work, and further limited to those making a successful compensation claim and pursuing rehabilitation. We might expect that those with support from Worker's Compensation Boards may have a higher rate of return to work than those suffering the same injuries in a non-occupational setting. The low population available meant our sample size precluded further statistical analysis. The numbers available represent the very low incidence of ULA in the developed world. Finally, return to work in itself is an incomplete outcome measure: it is not synonymous with functional or holistic recovery. Reasons behind unsuccessful return to work were not elucidated. These reasons could be as varied as functional deficits, general mental health sequelae, or the economic climate. An understanding of returns to work after ULA is important for offering an accurate prognosis during rehabilitation, and also for insurers making rehabilitation coverage decisions. In conclusion, it is encouraging that the majority of injured workers return to work after upper limb amputation, and it seems that younger age is a protective factor. Research has been limited by the extremely low incidence of such injuries, and a multi-centre study may be warranted to overcome this.

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Table 1. Incidence of different types of occupations before and after amputation in a population of Workers' Compensation claimants.

National Occupational Classification type	Frequency Before Amputation	Frequency After Amputation
Owner, retail	2	0
Mill manager	1	0
Stenotype operator	0	1
Inventory Clerk	2	2
Electrical Engineer	0	1
Job counselor	0	1
Butcher	1	1
Sales associate	0	1
Customer service	0	2
Custodian	3	1
Carpenter/Electrician	3	2
Rail Vehicle Mechanic	6	4
Installer, siding	1	1
Driver, industrual	2	1
Municipal labourer	1	1
Cutter, cordwood	1	1
Harvest worker	1	1
Foreman	2	2
Saw operator	6	4
Cabinet Assembler	1	1
Labour, general	20	10
Not working	0	14

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