Factors affecting the return to work of total hip arthroplasty due to of developmental hip dysplasia in in young patients

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ARTICLE INFO

Keywords:

Joint replacements
Hip
Outcome
Developmental dislocation of hip

ABSTRACT

Introduction: The aim of this study was to examine the factors affecting return to work after Total hip arthroplasty (THA) applied for coxarthrosis due to developmental hip dysplasia (DDH).

Methods: The study included 51 patients aged < 60 years in the period 2004–2010. The demographic information was recorded for all patients and the pre-postoperative Modified Harris score, EQ-5D, EQ-5D VAS and Grimby activity score. With an evaluation of the current employment status at the final follow-up examination.

Results: Preoperatively, 21 patients were employed, 16 were unemployed and 14 were housewives, none of whom were able to perform housework tasks. Postoperatively, 30 patients were employed and 10 were unemployed. One of the previously employed patients decided preoperatively to retire and was therefore not employed postoperatively. Of the 14 housewives, 9 were able to undertake the housework themselves postoperatively. The mean time of return to work was 13.4 weeks. Factors affecting finding work postoperatively were determined to be body mass index, National Occupational Level, whether or not osteotomy was applied and the preoperative duration of unemployment.

Conclusions: As coxarthrosis associated with DDH develops earlier than primary coxarthrosis, these patients undergo surgery at a younger age and the vast majority are of working age. THA applied for coxarthrosis on the basis of DDH enables most patients to return to their preoperative work and offers the opportunity of finding work to some of those who were unemployed. This increases the contribution of these patients to the national economy.

1. Introduction

Developmental dysplasia of the hip (DDH) is a common cause of secondary osteoarthritis of the hip.¹ Due to the changes in anatomy and degenerative joint changes which occur at a young age, the treatment of DDH in adults can be challenging.^{2,3} Generally, hip arthroplasty due to hip dislocation and advanced stage secondary arthritis of this disease is applied to patients aged < 60 years. These individuals are usually active and part of the labour force and may often be at the peak of the earning years (45–65 years of age).^{4–6} Therefore, the disease can have serious consequences causing unemployment, decreased quality of life and may even necessitate change or termination of gainful employment.⁷ Research has also shown that the ability to work has important psychological effects as people in employment have a greater sense of self-worth as they feel more productive and have a structured life.⁸ Resuming work after surgery improves the economic situation of patients, thereby reducing the financial burden on society. Total hip arthroplasty (THA) is a cost-effective intervention providing significant

improvements in pain, physical function, and quality of life.^{9–11} Although rates of return to work after THA have been previously reported in literature.^{12–19} In a study of 86 cases, as only 15 patients were DDH, but this was not examined as a different category.¹² The aim of this study was to determine the factors affecting return to work after THA applied because of DDH.

2. Material and methods

Of patients with primary THA examined for secondary osteoarthritis due to DDH between 2004–2010, a total of 51 patients (44 females, 7 males; mean age 46.2 years; range 26–60 years) were included. All underwent unilateral surgery for coxarthrosis based on DDH. The dislocation level was classified according to the Crowe classification method.²⁰

A record was made preoperatively of age, gender, affected side, body mass index (BMI), level of education, marital status, number of dependents, employment status, level of occupation or self-employed

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status according to the National Occupational Level (NOL) and the period of unemployment before hip replacement. Levels of pain, mobility and psychological well-being were assessed using the Modified Harris Hip Score (HHS), EQ-5D and EQ-5D VAS and Grimby's activity scale²¹ preoperatively and at the postoperative final follow-up. These scales were evaluated in respect of factors affecting the return to work and the time of return to work. Other factors examined were whether or not osteotomy was applied, postoperative limb length discrepancy, and history of postoperative complications (infection, fracture, dislocation, heterotrophic ossification, nerve palsy or revision for any reason).

With the patient in a supine position, the direct anterolateral approach was applied in all cases. All the operations were performed by the same surgeon. Biomet acetabular cups and PPF or CDH cementless femoral stems and ceramic on ceramic implants (Warsaw, IN) were used in all patients. No shortening was applied on low dislocations. In high dislocations, a subtrochanteric shortening osteotomy was applied, if preoperative templating suggested that placing the acetabular cup in the true acetabulum would result in lengthening of > 4–4.5 cm or > 10% femur lengthening.

Postoperatively, all patients were restricted from adduction and external rotation movements for one month. Mobilisation was started on postoperative day 2 and the same physical therapy protocol was applied to all the patients.

Patients were called to follow-up examinations at 20 days, 6 weeks, 3 months, 6 months and 1 year postoperatively. At these follow-up evaluations, it was noted whether or not the patient had returned to their preoperative occupation and if so, when they had returned. For those who were not employed preoperatively, it was recorded whether or not they had found employment and when.

Occupation was classified based on the responses to the “type of work” and “job title” questions from the pre-surgery questionnaire using the Human Resources Development Canada National Occupation Classification Matrix 2006. This matrix, as previously described by Gignac et al., classifies jobs into nine main sectors, then further groups under 4 headings: 1- business, finance and administration; 2- health, science, teaching and the arts; 3- sales and service and, 4- trades, transportation and manufacturing.²² The current employment of the patients was classified according to the NOL. A separate category was made for housewives in this study, and it was determined whether or not they could perform housework tasks (sweeping, general cleaning, cooking) preoperatively and postoperatively.

2.1. Statistical analysis

Analyses of the data obtained in the study were made using IBM SPSS 23.0 statistics software. In the evaluation of the data, descriptive statistical methods were used (frequency, percentage, mean, standard deviation) and in the comparison of qualitative data, the Chi-square test was applied. Conformity of the data to normal distribution was tested with the Kolmogorov-Smirnov test and Shapiro-Wilk test. In the comparisons between the groups, One-Way ANOVA variance analysis and the Independent t-test were applied. The Paired Samples t-test was used to compare preoperative and postoperative values. In multiple comparisons, to determine from which group a difference originated, the Tukey HSD test was used. Correlations between the variables were evaluated with the Pearson and Spearman's Rho Correlation tests. A value of $p < 0.05$ was accepted as statistically significant.

3. Results

Subtrochanteric osteotomy was applied to 20 of 51 patients. The time to union in the osteotomy line was determined as mean 4.2 ± 1.2 months. Mean follow up time was 85.1 ± 16.3 (60–124) months. Table 1 shows the preoperative patients parameters.

In the whole patient group the mean HHS was observed to increase from 58.17 ± 8.9 preoperatively to 82.64 ± 9.4 postoperatively, the

Table 1
Preoperative patients parameters.

Parameters	Numbers	Percentage%	MeanSD	Range
Age	51	100	46.2	26–60
Gender				
Male	7	13.7		
Female	44	86.3		
Side				
Right hip	23	45.1		
Left hip	28	54.9		
Follow-up (months)			85.1 ± 16.3	60–124
BMI			29.1 ± 3	23.5–36
Level of education				
Low	17	33.3		
Medium	25	49		
High	9	19.7		
Marital status				
Single	7	13.7		
Married	44	86.3		
Number of dependents			2.1 ± 1.2	0–4
Employment status				
Preoperative employed	21	41.2		
Preoperative unemployed	30	58.8		
< 1 year	11	36.6	5.9 months	3–8 months
> 1 year	19	63.4		> 1 year
NOL				
A	0	0		
B	6	11.7		
C	21	41.2		
D	10	19.6		
Housewife	14	27.4		
Self employed				
Yes	5	9.8		
No	46	90.2		
DDH type				
Crowe I	5	9.8		
Crowe II	8	15.6		
Crowe III	11	21.5		
Crowe IV	27	52.9		

Grimby scale from 1.86 ± 0.5 to 3.96 ± 0.8 , the EQ-5D score from 0.48 ± 0.07 to 0.75 ± 0.1 , and the EQ-5D VAS from 60.6 ± 7.8 to 81.1 ± 8.8 . Postoperative complications developed in 7 patients (one intraoperative femur fracture, one superficial wound infection, one peroneal nerve palsy, one heterotrophic ossification), for which revision surgery was necessary in 3 cases (one non-union in the osteotomy line, one polyethylene wear, one recurrent dislocation).

Of the 21 patients employed preoperatively, 20 (95.3%) returned to their previous work at mean 13.4 ± 3 weeks and 1 retired in accordance with a decision taken preoperatively. Of the 16 patients who were unemployed preoperatively, 6 could not find work postoperatively and 10 (62.5%) found work at mean 13.4 ± 1.6 weeks postoperatively. When the housewives were excluded from the results, it was determined that while 21 (56.7%) of 37 patients were employed preoperatively, 30 (81%) were employed postoperatively. At the final follow-up examination, all of these patients reported that they were still working. Of the 14 patients who were housewives, none were able to perform housework tasks preoperatively. At the postoperative evaluations, 9 (64.2%) started to perform these tasks at mean 15.4 ± 2.5 weeks while 5 continued to be unable to perform this work (Table 2).

4. Discussion

When the housewives were not included in the study results, the employment status was seen to increase from 56.7% preoperatively to 81% postoperatively. The mean time of return to work for the patients

Table 2

The work status of the patients preoperatively and postoperatively.

21 patients Preoperatively employed	20 patients Postoperatively employed	Time to return to work; 13.4 ± 3 weeks
	1 patient Retired	
16 patients Preoperatively unemployed	10 patients Postoperatively employed	Time to return to work; 13.4 ± 1.6 weeks
	6 patients Postoperatively unemployed	
14 patients Preoperatively housewives cannot perform housework	9 patients Postoperatively can perform housework	Time to starting to perform housework; 15.4 ± 2.5 weeks
	5 patients Postoperatively cannot perform housework	

in this study was determined as 13.4 weeks. A statistically significant difference was determined between the genders with males returning to work at mean 12.3 ± 0.8 weeks and females at 14.6 ± 3.2 weeks ($p = 0.001$). In a study by Mobasheri et al., the employment rates were reported to increase from 62.9% preoperatively to 76% postoperatively, with the return to work at mean 10.5 weeks.¹² Cowle et al. reported the time of return to work as mean 13.9 weeks.²³

In the studies by Mobasheri et al and Nunley et al., the time of return to work by females was found to be later than that of males.^{12,17} In the current study, this finding was determined to be significant, in parallel with literature.

Johnsson and Persson demonstrated a positive association between the duration of preoperative and postoperative sick leave, with a reduction of sick leave to 6 months or less indicating a productive gain to society.¹⁴ In the current study, the rates of finding employment for patients who had been unemployed for more than 1 year preoperatively were found to be lower than those of the patients who were unemployed for less than 1 year preoperatively ($p = 0.002$). These findings were consistent with those of Mobasheri et al.¹² Those who were employed preoperatively returned to work at a much higher rate after surgery than those who had been unemployed preoperatively (95.2% vs 62.5%, $p = 0.001$). Other authors have reported similar results, which reinforces the importance of applying surgery during the productive working life.^{12,14–16}

Bohm et al. did not find level of education, self-employment status and number of dependents to be statistically significant in respect of the return to work.¹⁹ While these criteria were not found to be significant in the current study in respect of finding work, a statistically significant relationship was seen in that as the level of education increased, so the time of return to work shortened and this was consistent with the findings of Nevitt et al.¹⁶

In the NOL classification, a statistically significant correlation was determined as the return to work was prolonged with a progression from B to D classifications ($p = 0.006$). Of the 16 patients who were unemployed preoperatively, 9 of the 10 patients who found work postoperatively were seen to have found work in the B and C category groups and only 1 was in the D group. This was interpreted as patients being able to find work that was less physically demanding after THA. Cowie et al. reported that a large proportion of patients returning to work had sedentary jobs.¹⁸ Visuri et al. also showed that mental work was positively associated with a return to work, whereas physical work, unskilled workers and farmers were seen to have negative associations with a return to work.²³ Sankar et al. found that an early return to work was associated with working in business, finance or administration, and work of low physical demand.²⁴

Most previous studies have found that age is related to a return to work, with a lower age indicating higher rates of return to work.^{15,18,25} However, Suarez et al. did not find any association of age with return to work.¹³ In the current study, no statistically significant correlation was determined between age and the time of return to work or being able to find work. Suarez also reported that marital status was not associated

with return to work whereas in the current study, the single patients were seen to return to work earlier.

In the current study, the time of return to work of patients with BMI < 30 was determined to be statistically significantly earlier ($p = 0.002$) and the rate of finding work postoperatively was greater (0.034). BMI was stated as a parameter related to return to work in studies by Cowie et al. and other researchers, but no difference was found in any of those studies.^{18,26,27}

In a study by Peak et al., postoperative functional restrictions following THA surgery were reported to affect the time of return to work.²⁸ However, in the current study, this variable was not calculated for the postoperative restrictions of the patients.

In addition to these variables, in the current study the return to work of those with Crowe Type 1 and 2 was seen to be earlier than those with Crowe Type 3 and 4 defects ($p = 0.003$). This can be attributed to the fact that all the 20 patients to whom osteotomy was applied were classified as Crowe Type 3 or 4. As the return to work was longer in the patients who underwent osteotomy ($p = 0.00$), the postoperative unemployment rate was found to be higher compared to those who did not undergo osteotomy ($p = 0.015$). As the time of union of the osteotomy line increased, so the time of return to work was seen to be prolonged ($p = 0.022$).

In the current study, it was observed that as the postoperative limb length discrepancy decreased, so there was an earlier return to work ($p = 0.000$). From the statements given by patients at the postoperative follow-up examinations, it was learned that limb length discrepancy was an important factor in respect of patient morale, motivation and postoperative satisfaction. When the degree of patient anxiety and depression was evaluated in the E options of the EQ-5D scale, it was observed that those with < 1 cm limb length inequality indicated the option of “I’m not anxious or disheartened”, and those with > 1 cm discrepancy more often selected the option of “I’m moderately anxious or disheartened”.

Patients who did not develop complications were observed to return to work in a shorter time ($p = 0.039$).

Of the patients who underwent revision surgery, 1 was unemployed preoperatively and 1 was a housewife who was not able to perform housework tasks. Following revision surgery, the housewife was still unable to perform housework tasks and the other 2 patients could not find employment. Table 3 shows the p values of variables.

In all the patients included in the study, a statistically significant increase was determined in the postoperative HHS, Grimby’s scale score, EQ-5D and EQ-5D VAS values compared to the preoperative values ($p < 0.05$). Table 4 shows the values preoperative and postoperative of HHS, Grimby’s scale score, EQ-5D and EQ-5D VAS. These findings were consistent with those of previous studies^{15,16,19}. Bohm et al. reported that better Oxford 12 hip scores and general physical function scores were positively associated with a return to work.²⁵ However, in a study by Nunley et al., no association was determined between preoperative functional activity scores and work outcomes.¹⁷

In the patients who returned to work before 16 weeks, the

Table 3
p Value of variables.

	Time of return to work	Finding employment
Age	0.851	0.512
Gender	0.001	1.000
Crowe	0.003	0.218
Education level	0.004	0.235
Number of dependents	0.256	0.553
Marital status	0.009	0.853
Complications present/absent	0.039	0.272
BMI	0.002	0.034
NOL	0.006	0.011
Self-employed	0.330	
Whether or not osteotomy was applied	0.000	0.015
Time to union of osteotomy line	0.022	0.095
Postoperative limb length discrepancy	0.000	0.085
Duration of unemployment	0.000	0.002

preoperative and postoperative HHS, EQ-5D and EQ-5D VAS scores were found to be statistically significantly high and even higher in those who were employed preoperatively ($p < 0.05$). However, when the differences between the preoperative and postoperative values were examined, being employed preoperatively or returning to work before 16 weeks were not seen to be factors increasing the scores. Only the increase in the postoperative Grimby's activity level was seen to be more increased in those who were employed preoperatively. In a study by Tilbury et al., patient-reported outcomes (preoperative SF-36, EQ-5D, EQ5D-VAS and HOOS/KOOS scores) of patients who were working preoperatively and had returned to work were compared with those who had not returned to work after 1 year and were not retired. No statistically significant difference was determined in the THA and TKA patient groups, respectively.²⁹

Although the ability to resume work in and of itself may positively influence a patient's self-reporting of physical function, it must also be considered that improved physical functioning has a direct positive impact on the ability to return to work.

Although the increased values of patients who underwent revision were all lower than those who had not undergone revision surgery, only the increases in the Grimby's and EQ-5D values of the revision patients were found to be significantly lower.

Of the 21 patients who were employed preoperatively, only 1 did not return to work and as that patient had decided to retire preoperatively, the reasons for not returning to work could not be clearly defined.

This study is associated with several limitations. The study was retrospective evaluation of a prospectively followed patient groups. Also, as the number of patients in the current study was low, and only 1 patient did not return to work, so factors preventing a return to work could not be evaluated.

In English literature, no study could be found that examined the factors affecting the return to work in cases of hip arthroplasty associated only with congenital hip dislocation. In a study of 86 cases, as only 15 patients were DDH, this was not examined as a different category.¹²

Patients with a basis of DDH have complaints of pain and restricted function at an earlier age compared to those with primary coxarthrosis and this restriction may lead to a decrease in quality of life, changes in working life and even the loss of work. Thus, the economic situation of the patient may be reduced. Changing the joint surface may enable the patient to continue in their current work or find work. Although surgery places a burden on the national economy, by allowing the patient to remain as a member of the productive workforce postoperatively, the long-term cost can be said to be lower. The results of this study have shown that THA applied because of DDH to patients aged < 60 years is

Table 4
The values preoperative and postoperative of HHS, Grimby's scale score, EQ-5D and EQ-5D VAS. The differences between the preoperative and postoperative values*.

	All patients			Preoperative employment			Time to return to work			Complications			Revision surgery		
	Total (n = 51)			No (n = 30)			< 16 weeks (n = 31)			Absent (n = 44)			Present (n = 7)		
	p			p			p			p			p		
Preop. HHS	58.1 ± 8.9	54.1 ± 6.6	64.0 ± 8.6	58.1 ± 8.9	54.1 ± 6.6	64.0 ± 8.6	62.5 ± 7.4	50.5 ± 6.4	59.3 ± 8.9	51.1 ± 5.5	58.6 ± 8.9	50.7 ± 5.0	58.6 ± 8.9	50.7 ± 5.0	
Postop. HHS	82.6 ± 9.4	77.9 ± 8.2	89.5 ± 6.5	82.6 ± 9.4	77.9 ± 8.2	89.5 ± 6.5	87.3 ± 8.0	76.6 ± 5.7	84.3 ± 8.7	72.4 ± 8.0	83.4 ± 9.1	70.3 ± 5.9	83.4 ± 9.1	70.3 ± 5.9	
Postop - Preop HHS*	24.5	23.8 ± 5.7	25.5 ± 4.4	24.5	23.8 ± 5.7	25.5 ± 4.4	24.9 ± 5.1	26.2 ± 4.6	25.0 ± 4.8	21.3 ± 7.2	24.8 ± 4.8	19.7 ± 10.6	24.8 ± 4.8	19.7 ± 10.6	0.492
Preop. Grimby's scale	1.8 ± 0.5	1.7 ± 0.6	2.0 ± 0.2	1.8 ± 0.5	1.7 ± 0.6	2.0 ± 0.2	2.1 ± 0.4	1.8 ± 0.4	2.0 ± 0.5	1.1 ± 0.4	1.9 ± 0.5	1.0 ± 0.0	1.9 ± 0.5	1.0 ± 0.0	
Postop. Grimby's scale	3.9 ± 0.8	3.6 ± 0.9	4.5 ± 0.6	3.9 ± 0.8	3.6 ± 0.9	4.5 ± 0.6	4.3 ± 0.7	3.8 ± 0.6	4.1 ± 0.8	3.0 ± 1.0	4.1 ± 0.8	2.3 ± 0.6	4.1 ± 0.8	2.3 ± 0.6	
Postop - Preop Grimby's scale*	2.1	1.9 ± 0.5	2.4 ± 0.6	2.1	1.9 ± 0.5	2.4 ± 0.6	2.3 ± 0.6	2.0 ± 0.4	2.1 ± 0.6	1.9 ± 0.7	2.1 ± 0.6	1.3 ± 0.6	2.1 ± 0.6	1.3 ± 0.6	0.023
Preop. EQ-5D	0.48 ± 0.07	0.45 ± 0.1	0.52 ± 0.1	0.48 ± 0.07	0.45 ± 0.1	0.52 ± 0.1	0.51 ± 0.1	0.46 ± 0.1	0.5 ± 0.1	0.4 ± 0.0	0.5 ± 0.1	0.4 ± 0.0	0.5 ± 0.1	0.4 ± 0.0	
Postop. EQ-5D	0.75 ± 0.1	0.7 ± 0.1	0.8 ± 0.1	0.75 ± 0.1	0.7 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.7 ± 0.1	0.8 ± 0.1	0.6 ± 0.1	0.8 ± 0.1	0.6 ± 0.1	0.8 ± 0.1	0.6 ± 0.1	
Postop - Preop EQ-5D*	0.27	0.3 ± 0.1	0.3 ± 0.0	0.27	0.3 ± 0.1	0.3 ± 0.0	0.3 ± 0.0	0.3 ± 0.1	0.3 ± 0.1	0.2 ± 0.1	0.3 ± 0.0	0.2 ± 0.1	0.3 ± 0.0	0.2 ± 0.1	0.000
Preop. EQ-5D VAS	60.6 ± 7.8	57.6 ± 7.9	64.9 ± 5.3	60.6 ± 7.8	57.6 ± 7.9	64.9 ± 5.3	63.9 ± 6.2	58.3 ± 5.3	62.3 ± 6.3	49.7 ± 8.1	61.7 ± 6.6	43.3 ± 5.8	61.7 ± 6.6	43.3 ± 5.8	
Postop. EQ-5D VAS	81.1 ± 8.8	78.3 ± 9.6	85.2 ± 5.6	81.1 ± 8.8	78.3 ± 9.6	85.2 ± 5.6	85.5 ± 6.5	77.1 ± 5.7	83.2 ± 7.2	68.6 ± 7.7	82.4 ± 7.5	61.7 ± 5.8	82.4 ± 7.5	61.7 ± 5.8	
Postop - Preop EQ-5D VAS*	21.5	20.7 ± 4.5	20.3 ± 3.9	21.5	20.7 ± 4.5	20.3 ± 3.9	21.6 ± 3.8	18.8 ± 5.0	20.8 ± 4.2	18.9 ± 4.6	20.7 ± 4.2	18.3 ± 5.8	20.7 ± 4.2	18.3 ± 5.8	0.354

an effective operation which postoperatively increases the functions, quality of life, morale and motivation of the patient, increases the workforce and reduces pain.

Conflict of interest

None of the authors has received or will receive benefits for personal or professional use from a commercial party and organization related directly or indirectly to the subject of this article. The authors report no conflict of interest.

Funding

There is no funding source.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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