

Ability to return to work without restrictions in workers compensation patients undergoing hip arthroscopy

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Submitted 27 April 2016; Revised 2 August 2016; revised version accepted 2 October 2016

ABSTRACT

The purpose of this study was to investigate the ability of worker's compensation (WC) patients to return to work without restrictions after hip arthroscopy. Twenty-nine WC patients along with age and gender matched controls who underwent hip arthroscopy were retrospectively reviewed after achieving maximum medical improvement (MMI) status at minimum 1 year postoperatively. Patient demographic factors were evaluated, along with the Hip Outcome Score Activities of Daily Living and Sports-Specific subscales, and the modified Harris Hip Score (mHHS). The majority of WC patients were able to return to work without restrictions after reaching MMI (20/29, 69.0%). WC patients who failed to return to work without restrictions had a prolonged time from injury to surgery (3.01 ± 2.16 months versus 6.36 ± 4.16 months; $P = 0.0079$), more concomitant orthopedic injuries (4/20, 20.0% versus 9/9, 100%; $P = 0.0001$), and higher body mass index (BMI) (26.61 ± 3.52 versus 29.54 ± 3.43 ; $P = 0.047$) than those who returned to work without restrictions. WC patients had significant improvement of patient-reported outcome scores following hip arthroscopy ($P < 0.0001$), but WC patients who returned to work without restrictions had higher scores than those who failed to do so (HOD-ADL: $P < 0.0001$; HOS-SS: $P = 0.004$; mHHS: $P = 0.009$). The majority of WC patients are able to return to work without restrictions when they reach MMI status following hip arthroscopy. Factors associated with failure to return to work without restrictions include prolonged time course between injury and surgical treatment, concomitant orthopaedic injuries, and a higher BMI. Level III, retrospective case-control study

INTRODUCTION

Surgical results in workers' compensation (WC) patients have been consistently associated with inferior outcomes in the orthopaedic literature when compared with non-WC patients. Harris *et al.* [1] performed a meta-analysis on 129 studies analysing the relationship between compensation status and outcomes, suggesting that WC patients were three times more likely to receive an inferior outcome from surgery when compared with non-WC patients. Several studies evaluating knee and shoulder outcomes in

the WC population exist in the literature, but there is a paucity of information examining this patient population in the context of hip arthroscopy [2–9]. However, Lee *et al.* [10] recently performed one of the larger reviews, examining 268 cases of arthroscopic labral debridement and identified workers compensation status as one of five predictors of a longer recovery time in patients undergoing hip arthroscopy.

Hip arthroscopy is believed to be a common, effective and safe method of treating pathologic hip conditions such

as femoroacetabular impingement (FAI) and labral tears [11–16]. Although it has been shown that patients in general perform well after hip arthroscopy, the subset of WC patients may be susceptible to worse outcomes. Recently, Stake *et al.* [17] performed a comparative analysis between WC and control patients, showing that WC patients undergoing arthroscopic hip surgery presented with lower pre-operative patient-reported outcome scores as compared with their non-WC counterparts. However, these patients still attained significant improvement from arthroscopic hip surgery. Salvo *et al.* [18] returned to work an average of 6.8 months after surgery with only 58% of patients currently working at time of most recent follow-up. They also demonstrated that WC patients had a significantly higher Hip Outcome Score compared with controls. Gigi *et al.* [19] also recently showed that patients undergoing hip arthroscopy for work-related injuries with active work claims had significantly lower patient reported outcomes scores at most recent follow-up compared with patients with sports related injuries, but interestingly not significantly higher than a group of non-sports-related injuries without pending active work claims. However, the work-related injuries were again able to demonstrate significant improvements in outcomes scores compared with baseline.

Interestingly, WC patients have typically been analysed as a single group in the orthopedic literature. Comparative differences within the differential outcome groups in this population after hip arthroscopy have not yet been explored. The purpose of this study was to investigate the ability of WC patients to return to work without restrictions after hip arthroscopy and factors associated with failure to return to work without restrictions

METHODS

Study design

Institutional review board approval was obtained for this study (IRB: 120221080). Prospective data on all workers' compensation patients undergoing hip arthroscopy with labral repair, acetabular rim-trimming and/or femoral osteochondroplasty by a single fellowship-trained surgeon from January 2010 to May 2012 was analysed. Inclusion criteria encompassed WC patients with age greater than eighteen, diagnosis of unilateral symptomatic labral tear in the setting of FAI who had failed non-surgical treatment, patients who had reached maximum medical improvement (MMI) at a minimum 1-year after hip arthroscopy. Exclusion criteria encompassed patients who had previous hip pathology, as well as those who had not yet reached MMI. A

control group was also created matched by age (± 3 years) and gender to the WC patients, and used for comparison.

Patients who met the study criteria completed a pre-operative questionnaire that included relevant demographic information including age, gender, body mass index (BMI), side of operative extremity, past surgical history, concomitant orthopedic issues (prior lower extremity or spine surgery) and smoking and alcohol consumption. Mechanism of hip injury was recorded. Intraoperative data included both diagnostic information as well as procedures performed including acetabular rim trimming, labral refixation, femoral osteochondroplasty, iliopsoas lengthening, type of capsular repair, trochanteric bursectomy and iliotal band lengthening.

Functional outcome evaluation

WC patients and controls completed hip-specific outcome instruments including the Hip Outcome Score Activity of Daily Living (HOS-ADL) and Sport-Specific Subscales (HOS-SS) [20, 21], and the modified Harris Hip Score (mHHS) [22, 23] at baseline and at least one year following surgery. All complications were also recorded. Primary outcome measures included ability to return to work without restrictions, US Department of Labor Dictionary of Occupational Titles physical exertion requirements classification work level at MMI (light, medium, heavy) [24], and need for revision hip arthroscopy.

Radiographic analysis

Plain radiographs were performed at baseline and at final recent follow-up and read by the senior author. All patients had a standard anteroposterior radiographs for the pelvis, false profile view, and oblique lateral (Dunn) view with the patient in a supine position. All radiographs were performed with the coccyx positioned midline, approximately one centimeter above the pubic symphysis (neutral tilt) and the obturator foramina and the trochanters symmetric (neutral rotation) [25]. The lateral center edge angle of Wiberg and alpha angle were measured on plain radiographs using a digital picture archiving and communication system [25, 26].

Surgical technique

All patients underwent hip arthroscopy under general anesthesia using a previously described technique [9, 27]. Patients were placed in the supine position on a traction table with a well-padded perineal post. Axial traction was then applied [28–30], and the time onset of hip distraction was marked by the circulating nursing staff to assure safe duration of traction time.

An anterolateral (AL) portal was first established. Prior to fluid introduction, needle-localized placement of an anterior portal was performed. After cannulation and introduction of the arthroscope through the AL portal, the AL portal was established under direct spinal needle localization. A transverse interportal capsulotomy measuring ~4 cm in length was performed from 12 to 2 o'clock about 5–8 mm from the labrum. The capsule adjacent to the acetabulum was then reflected to expose the superior acetabular rim from the indirect head of the rectus femoris insertion (12 o'clock position) laterally to the iliopsoas tendon (3 o'clock position) anteriorly. Acetabular rim trimming and labral refixation with suture anchors was then performed as appropriate [29] using a distal anterolateral accessory (DALA) portal. Next, the traction was released and the hip was flexed roughly 30°. A T-capsulotomy was then performed using an arthroscopic scalpel through a 5.0-mm cannula in the DALA portal at the interval between the iliocapsularis and the gluteus minimus. The T-capsulotomy was performed perpendicular to the prior transverse capsulotomy along the length of the femoral neck distally to the capsular reflection at the intertrochanteric line in order to access the femoral head-neck junction in the peripheral compartment. All indicated procedures, including femoral osteochondroplasty between 12 and 6 o'clock, were then performed and the hip was taken through a dynamic fluoroscopic examination. The capsule then was closed arthroscopically and the portals were approximated in a layered fashion.

Rehabilitation

Post-operatively, all patients took part in a standardized physical rehabilitation protocol. A hip orthosis was worn for the first 3 weeks to limit flexion to 90 degrees, abduction to 30 degrees, extension to 0 degrees and internal/external rotation to 20 degrees. They were also restricted to a crutch-assisted gait with 20 pounds foot flat for the first 3 weeks and a continuous passive motion machine is utilized during this period to assist with hip range of motion. Physical therapy starts with passive range of motion exercises along with isometrics and progresses the patient to full weight bearing as tolerated with active range of motion and strengthening by 6 weeks. Over the next 6 weeks, the patients progress to performing all community ambulation unassisted while progressing with closed-chain kinetic strengthening. The next four weeks of therapy are spent performing work-specific activities before returning to work. Patients considered to be at medium or heavy level work duties underwent a one month period of work conditioning prior to return to work.

Statistical analysis

A power analysis was performed to ensure adequate power to detect differences between the WC patients who returned to work without restrictions and those who failed to do so. WC patients who returned to work without restrictions were compared with those who failed to do so. WC patients were also compared with controls. Comparative statistical analysis of continuous variables was performed utilizing independent samples paired and unpaired t-tests. An analysis of covariance was subsequently performed on post-operative outcome scores to ensure that the observed statistical effect was not influenced by pre-operative baseline values. Contingency analysis was carried out with chi-squared or Fisher's exact test for nominal variables. A *P* values of less than 0.05 was considered to be statistically significant (SPSS Version 21, Chicago, IL).

RESULTS

Ability to return to work without restrictions

Twenty-nine WC patients were available for analysis after reaching MMI at minimum 1-year post-operative following hip arthroscopy. There were no reoperations and no complications. Twenty WC patients were able to return to work without restrictions (69.0%), while 9 were not able to return to work or returned to work with permanent restrictions (31.0%). Factors associated with failure of WC patients to return to work without restrictions were longer time from injury to surgical intervention (3.01 ± 2.16 versus 6.36 ± 4.16 months; $P = 0.0079$), higher incidence of concomitant orthopedic injuries (4/20, 20.0% versus 9/9, 100%; $P = 0.0001$), and higher BMI (26.61 ± 3.52 versus 29.54 ± 3.43 ; $P = 0.047$). There were no other differences in patient demographics or radiographic measurements between those who returned to work without restrictions and those who failed to do so (Table I).

Mechanism of injury and US Department of Labor Dictionary of Occupational Titles physical exertion requirements classification for each WC patient were recorded (Table II) [23]. Of patients who were able to return to work without restrictions, five patient occupations were classified as 'Heavy' (25%), eight as 'Medium' (40%) and seven as 'Light' (35%) work levels. The WR group had four patient occupations classified as 'Heavy' (44%), three as 'Medium' (33%) and two as 'Light' (22%) work levels. Work level classifications were not significantly different statistically between patients who were able to return to work without restrictions and those who failed to do so ($P = 0.684$).

Comparison of WC patients to controls

The 29 WC patients and 29 age- and gender-matched controls were compared (Table III), revealing that WC

Table I. Demographic characteristics of the Workers' Compensation patients who returned to work without restrictions (Returned) and those who failed to do so (Failed)

	Returned (n = 20)	Failed (n = 9)	P-values
Gender			
Male	10	4	
Female	10	5	
Mean age at surgery	37.3 ± 10.8 years	42.9 ± 6.85 years	
CEA	36.1 ± 8.77	42.7 ± 7.02	
AA	58.7 ± 6.73	58.2 ± 8.10	
Surgical side			
Left	9	3	
Right	11	6	
Time in between:			
Presentation-surgery	3.01 ± 2.16 months	6.36 ± 4.16 months	(P = 0.0079)
Injury-presentation	11.74 ± 11.6 months	14.48 ± 12.3 months	
Injury-surgery	14.75 ± 11.3 months	20.83 ± 14.05 months	
Associated injuries	4	9	(P = 0.0001)
Smoker	4	2	
Drinker	8	2	
BMI	26.61 ± 3.52	29.54 ± 3.43	(P = 0.047)

CEA, Center Edge Angle; AA, Alpha Angle; MMI, Maximum Medical Improvement; BMI, Body Mass Index.

patients had higher BMI (Control: 24.96 ± 3.86 ; WC: 27.52 ± 3.70 ; $P = 0.012$), higher incidence of concomitant orthopaedic injuries (Control: 4/29, 13.8%; WC: 13/29, 44.8%; $P = 0.020$), and were more likely to smoke (Control: 1/29, 3.4%; WC: 6/29, 20.7%; $P = 0.037$). There were no significant differences in the specific procedures each group underwent (Table III). There were also no other differences in patient demographics or radiographic parameters.

Functional outcome score assessment

All patient-reported outcome scores at most recent follow-up were significantly improved as compared with preoperative baseline levels for WC patients and matched controls ($P < 0.0001$). WC patients had significantly lower scores on the HOS-ADL, HOS-SS, and mHHS as compared with controls both preoperatively ($P < 0.0001$, $P = 0.025$, $P = 0.001$, respectively) and at most recent

follow-up ($P < 0.0001$, $P = 0.001$, $P = 0.011$, respectively) (Table IV).

WC patients who returned to work without restrictions and those who failed to do so both exhibited significant improvements in outcome scores following hip arthroscopy ($P < 0.0001$). WC patients who returned to work without restrictions achieved higher post-operative scores in all three patient reported outcomes as compared with those who failed to do so (HOD-ADL: $P < 0.0001$; HOS-SS: $P = 0.004$; mHHS: $P = 0.009$) (Table V).

DISCUSSION

This study examines the ability of WC patients to return to work without restrictions after reaching MMI following hip arthroscopy and factors associated with failure to return to work without restrictions. We find that the majority (69.0%) of WC patients are able to return to work without restrictions after reaching MMI a minimum of 1-year following hip arthroscopy. The patients who were unable to

Table II. Age, gender, US Department of Labor Dictionary of Occupational Titles physical exertion requirements classification and mechanism of injury for Workers' Compensation patients

<i>Age</i>	<i>Gender</i>	<i>Work classification</i>	<i>Mechanism of injury</i>
24	F	Light	Fall
25	F	Light	Fall
29	M	Heavy	Fall
29	F	Medium	Kickboxing accident
29	M	Medium	Fall
29	M	Medium	Fall
29	M	Medium	Injured with pivot motion while dancing
30	F	Light	Lifting a heavy object
30	F	Light	Altered hip biomechanics after foot accident
30	M	Heavy	Lifting a heavy object
32	F	Light	Fall
33	M	Heavy	Hip was hyperflexed and twisted
33	M	Heavy	Fall
38	M	Light	Over abduction and internal rotation
38	F	Medium	Twisting and external rotation injury while dancing
39	M	Heavy	Lifting and throwing heavy objects
39	F	Heavy	Fall
40	F	Light	Motor vehicle accident
42	F	Light	Fall
43	F	Medium	Twisting injury during a slip on the stairs
44	F	Medium	Insidious onset
47	F	Heavy	Motor vehicle accident
47	M	Medium	Fall
47	M	Medium	Fall
48	M	Heavy	Direct trauma
50	F	Medium	Motor vehicle accident
55	F	Light	Fall
57	M	Heavy	Fall
60	M	Medium	Fall

Table III. Demographic characteristics of the workers compensation cohort and the age-gender matched controls

	WC (n = 29)	Control (n = 29)	P-values
Gender			
Male	14	14	
Female	15	15	
Mean age at surgery	39.1 ± 9.94 years	40.4 ± 9.97 years	
CEA	38.2 ± 8.67	35.1 ± 7.23	
AA	58.6 ± 6.97	59.3 ± 11.1	
Surgical side			
Left	12	11	
Right	17	18	
Time in between:			
Presentation-surgery	4.05 ± 3.26 months	3.31 ± 3.43 months	
Follow-up (months)	24.5 ± 11.9	22.8 ± 5.33	
Associated injuries	13	4	(P = 0.020)
Smoker	6	1	(P = 0.037)
Drinker	10	9	
BMI	27.52 ± 3.70	24.96 ± 3.86	(P = 0.012)
Combined acetabular rim trimming and femoral osteochondroplasty	25	22	
Femoral osteochondroplasty only	4	7	
Iliopsoas lengthening	11	8	
Trochanteric bursectomy	8	6	
Iliotibial band lengthening	4	6	

WC, Workers' Compensation; CEA, Center Edge Angle; AA, Alpha Angle; BMI, Body Mass Index.

return to work without restrictions had higher BMI, higher rate of concurrent orthopaedic injuries, and longer time from injury to surgery. WC patients exhibit significant improvement in patient reported outcomes regardless of ability to return to work without restrictions, but scores remained lower than age and gender matched controls. The results of this study not only provide clinicians valuable information on the results of hip arthroscopy in WC patients compared with matched controls, but also identifies factors associated with failure to return to work without restrictions.

WC status has been associated with inferior outcomes after orthopedic surgery in general and specifically for hip

arthroscopy as well [1, 10, 31]. Potter *et al.* [3] followed a military cohort receiving arthroscopic acetabular labral debridement and showed that patients with disability status exhibited significantly lower post-operative mean mHHS ($P < 0.0001$), lower Short Form-36 subscale scores ($P < 0.02$), and lower satisfaction rates ($P < 0.04$) as compared with non-disability patients. Conversely, Byrd showed that successful outcomes could be achieved in a small number of workers' compensation patients undergoing hip arthroscopy, finding no significant differences in the Harris Hip Scale between WC patients and non-WC patients [32] Stake *et al.* [17] performed a case-control study and found that workers' compensation patients had

Table IV. Comparison of pre-operative and post-operative patient-reported outcome scores for the WC patients and the matched controls

	WC	Controls	P-values
All WC (<i>n</i> = 29)			
Preoperative			
HOS-ADL	46.5 ± 16.9	69.2 ± 19.6	(<i>P</i> < 0.0001)
HOS-SS	25.4 ± 26.3	43.6 ± 27.9	(<i>P</i> = 0.025)
mHHS	43.0 ± 17.5	61.2 ± 15.9	(<i>P</i> = 0.001)
Post-operative			
HOS-ADL	76.8 ± 12.5	89.9 ± 6.76	(<i>P</i> < 0.0001)
HOS-SS	64.7 ± 14.5	79.2 ± 13.4	(<i>P</i> = 0.001)
mHHS	69.3 ± 11.2	78.6 ± 8.31	(<i>P</i> = 0.011)

NR, NR Outcomes; WR, Poor Outcomes; HOS-ADL, Hip Outcome Score—Activities of Daily Living; HOS-SS, Hip Outcome Score—Sports Specific Subscale; mHHS, Modified Harris Hip Scale.

Table V. Comparison of pre- and post-operative patient-reported outcome scores for the WC patients who returned to work without restrictions and those who failed to do so

	Returned	Failed	P-values
Preoperative			
HOS-ADL	50.9 ± 16.2	37.2 ± 15.5	(<i>P</i> = 0.059)
HOS-SS	29.4 ± 30.8	18.6 ± 15.3	(<i>P</i> = 0.367)
mHHS	49.5 ± 13.9	28.7 ± 16.8	(<i>P</i> = 0.011)
Post-operative			
HOS-ADL	82.0 ± 8.82	65.3 ± 12.0	(<i>P</i> < 0.0001)
HOS-SS	69.6 ± 10.9	53.7 ± 16.2	(<i>P</i> = 0.004)
mHHS	74.0 ± 6.29	59.0 ± 13.1	(<i>P</i> = 0.009)

HOS-ADL, Hip Outcome Score—Activities of Daily Living; HOS-SS, Hip Outcome Score—Sports Specific Subscale; mHHS, Modified Harris Hip Scale.

lower pre- and post-operative patient-reported outcome scores than their non-WC counterparts, but experienced the same magnitude of improvement in outcome scores with surgery.

Comparable outcomes have been achieved in shoulder surgery for WC patients. Nicholson studied a cohort of 40 WC patients undergoing arthroscopic acromioplasty and

found that post-operative American Shoulder and Elbow Surgeons scores (ASES), Simple Shoulder Test scores (SST) and Visual Analog Scale (VAS) pain scores were not significantly different as compared with non-WC patients [9]. However, WC patients had a significantly longer average time period prior to returning to full-duty work (*P* = 0.0001) [9]. Bhatia *et al.* [27] found that 88.5% in a cohort of 69 WC patients returned to their preoperative level of work at a mean time to MMI of 7.6 months after arthroscopic rotator cuff repair. These patients demonstrated improved outcomes using validated scoring scales at the time of follow-up, but outcomes remained inferior to non-WC patients as compared with a historical control group [27]. Cuff *et al.* [6] also found significantly lower ASES scores, SST scores, and VAS pain scores in a cohort of 50 WC patients undergoing arthroscopic rotator cuff repair as compared with non-WC patients (*P* < 0.0001). Interestingly, this study also stratified and analysed WC patients based on differential outcomes, showing that those who were compliant with the prescribed post-operative rehabilitation protocol performed better on the ASES, SST and VAS pain score as compared with non-compliant patients (*P* < 0.0001) at follow-up [6]. These results reinforce the findings presented in our study, emphasizing that a spectrum of outcomes exist within the WC population.

In accordance with the literature, our WC cohort also shows lower pre-operative and post-operative outcomes scores compared with matched-controls. Nevertheless, we found that WC patients had significantly improved outcome scores following hip arthroscopy regardless of ability to return to work without restrictions. Even though WC patients started at lower baseline outcome scores and ended up having lower post-operative outcome scores, their magnitude of improvement was similar to the matched-controls. This may indicate that since WC patients start at a lower baseline, the expectations regarding their ultimate outcomes would need to be adjusted accordingly.

The current study demonstrates a significantly larger BMI in WC patients as compared with matched controls as well as a significantly larger BMI in WC patients who failed to return to work without restrictions after hip arthroscopy as compared with WC patients who failed to do so. BMI has been shown in other studies to be an independent predictor of post-operative complications and inferior clinical outcomes. Gupta *et al.* [33] performed a retrospective review of 119 primary reverse total shoulder arthroplasties and determined that BMI was the only significant determinant of overall complication rates and medical complication rates (*P* < 0.05). Similar conclusions

have been found in studies on total shoulder arthroplasty, total knee arthroplasty and total hip arthroplasty [34–38]. Although the limited evidence exploring obesity in hip arthroscopy has not suggested significant impact on outcomes, Collins *et al.* argued that obesity significantly increases the risk of post-operative complications such as deep venous thrombosis and worsened hip pain [38, 39]. The potential interaction of a higher BMI in an already vulnerable group, such as WC patients, may represent an additional barrier to satisfactory outcomes. Identification of these patients preoperatively may be of benefit to the surgeon, allowing them to either adjust the expectations of the patient or to potentially apply weight loss interventions before surgery if appropriate.

WC patients who failed to return to work without restrictions after hip arthroscopy had higher rate of associated orthopaedic injuries and a longer time period between initial injury and hip arthroscopy. The reason for association of longer time from injury to surgery with failure to return to work without restrictions is not clear, but could potentially relate to deconditioning from longer timeframe of hip pain and dysfunction. Additionally, patients with associated injuries might have undergone workup and treatment for these injuries prior to addressing their hip pathology, which would represent a confounding variable. The WC patients who failed to return to work without restrictions had a 100% rate of concurrent orthopaedic conditions, as opposed to 20% in the patients who returned to work without restrictions. In addition to a slowed recovery from hip arthroscopy, the management of these injuries may actually potentiate the pain experienced in the hip. The presence of associated injuries should alert the surgeon to adjust expectations for the patient, informing them of a potentially slower recovery period.

Limitations

Our study is limited by the fact that our cohort reflects the patient population of only one tertiary care center in a major metropolitan area of one state. The findings based on this case mix may therefore not be generalizable. Differing worker's compensation (WC) regulations in different states may affect outcomes as well and may be confounded by conflicting issues such as potential secondary gain. Additionally, the study is retrospective in nature using a prospectively collected database and may potentially be underpowered as there were a limited number of eligible WC patients that met our inclusion criteria to be included in the analysis. Our sample size only allowed for matching on a limited number of variables, potentially not taking into account other important confounding variables. The patients' psychological state was also another potential

contributor to patient outcomes that was not explored in the current study. The addition of an outcomes survey with a psychological component such as the SF-12 or SF-36 would have been able to examine this component. Patients had follow-up for at a minimum of 1-year post-operative and until they obtained MMI status. This timeframe is relevant for treatment of a WC patient population regarding ability to return to work without restrictions and short-term patient reported outcomes, but longer follow-up would also provide valuable information about the durability of hip arthroscopy results in the WC patient population.

CONCLUSIONS

The majority of WC patients are able to return to work without restrictions when they reach MMI status following hip arthroscopy. WC patients exhibit significant improvement in patient reported outcomes regardless of ability to return to work without restrictions, but scores remained lower than age and gender matched controls. Factors associated with failure to return to work without restrictions include prolonged time course between injury and surgical treatment, concomitant orthopaedic injuries, and a higher BMI.

CONFLICT OF INTEREST STATEMENT

None declared.

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