Do Outcomes Differ After Proximal Hamstring Repair for Patients Receiving Workers' Compensation?

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Background: Patients with workers' compensation (WC) insurance claims are often shown to experience inferior patient-reported outcomes (PROs) after an orthopaedic surgical intervention compared with patients without WC claims.

Purpose: To compare the postoperative PROs of patients with WC claims (WC patients) versus those without WC claims (non-WC patients) after proximal hamstring repair (PHR).

Study Design: Cohort study; Level of evidence, 3.

Methods: WC patients who underwent PHR between November 2011 and to September 2020 were propensity score matched at a 1:2 ratio to non-WC patients according to age, sex, and body mass index. Comorbidity data were collected as well as minimum 1-year postoperative PRO scores for the Lower Extremity Functional Scale (LEFS), the Hip Outcome Score (HOS), and the 12-Item Short From Health Survey (SF-12) Physical Component Summary (PCS) and Mental Component Summary (MCS). The type of work was characterized according to national WC insurance guidelines as light (maximum 20 lbs [9.1 kg]), medium (maximum 50 lbs [22.7 kg]), or heavy (≥50 lbs) [>/=22.7 kg].

Results: A total of 30 patients (10 WC and 20 non-WC) were included. The work type and baseline demographic characteristics of patients did not differ between groups. There were no significant between-group differences in postoperative PRO scores as measured by the LEFS ($P = .488$), HOS ($P = .233$), or SF-12 PCS ($P = .521$). However, the WC cohort showed inferior SF-12 MCS scores compared with the non-WC group (49.28 ± 9.97 vs 54.26 ± 9.69, respectively; $P = .032$). The WC status was also associated with an increased time needed for patients to return to full-duty work capacity (21 ± 9 vs 9 ± 8 weeks; $P = .005$).

Conclusion: Our findings suggest that WC and non-WC patients who undergo PHR have comparable outcomes. Differences in SF-12 MCS scores and return to work time for full-duty capacity warrant further investigation.

Keywords: propensity score matching; proximal hamstring repair; return to work; workers' compensation

Hamstring injuries most often occur as strains or partial tears at the proximal muscle belly or the musculotendinous junction. Of these injuries, 12% represent a complete avulsion of the proximal attachment at the ischial tuberosity.[15] Proximal hamstring avulsion predominantly occurs in 45- to 59-year-old patients[12] and can lead to pain, weakness, and loss of time from sports, work, and daily activities—if treated nonoperatively.[15,22] Surgical repair of full proximal hamstring injuries produces good to excellent results with high satisfaction scores; thus, for active patients requiring push-off strength, surgical repair is often recommended.[1,4,7,22]

Although there is a paucity of literature explaining unsatisfactory outcomes after proximal hamstring repair (PHR), existing evidence in other fields—such as shoulder arthroplasty, isolated biceps tendinosis, and lumbar discectomy—suggests that patients presenting with workers' compensation (WC) insurance claims (WC patients) are associated with inferior outcomes compared with patients without WC claims (non–WC patients).[2,3,10,13]

The purpose of this study was (1) to determine whether there are any differences in postoperative patient-reported outcomes (PROs) after PHR and (2) to determine differences in time to return to work in WC patients versus non–WC patients. We hypothesized that WC patients would have inferior surgical outcomes and would be less likely to return to full-duty status after PHR when compared with non–WC patients.

METHODS

Study Design and Patient Population

After receiving institutional review board approval for the study protocol, we performed a retrospective case versus control chart review of patients treated surgically for a

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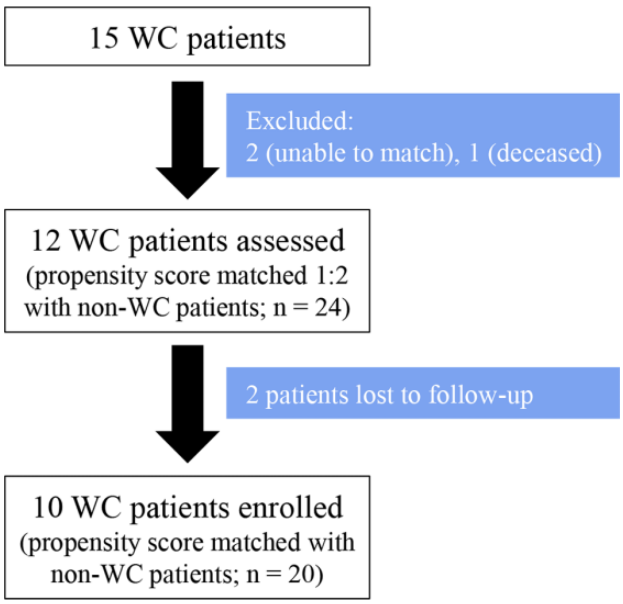

Figure 1. Flow diagram demonstrating patient inclusion for the WC and non-WC cohorts. WC, workers' compensation.

proximal hamstring rupture by a single sports medicine fellowship–trained orthopaedic surgeon (S.L.M.) between November 2011 and September 2020. Patients were included in this study if they met the following criteria: age ≥18 years; complete proximal hamstring tear identified on magnetic resonance imaging; minimum 1-year follow-up data; and a complete data set of PROs. Once eligible patients were identified, they were contacted via telephone, and informed consent was obtained.

The study groups consisted of a case cohort—including patients with an active WC claim in relation to their proximal hamstring injury—matched at a 1:2 ratio to a control cohort—including patients with proximal hamstring tear without WC status. Initially, 12 WC patients were propensity score matched with 24 non–WC patients. The final patient population consisted of 30 patients (n = 10 WC; n = 20 non-WC) after 2 WC patients were lost to follow-up (Figure 1).

Propensity Score Matching

The matching process was completed utilizing R statistical software (R Core Team Version 4.2.2) to generate propensity scores to match WC patients at a 1:2 ratio with non–WC patients. Sex, age, and body mass index (BMI) were included as the covariates in the logistic regression model to determine propensity scores. The nearest neighbor matching algorithm was employed matching participants without replacement to subgroups with the smallest propensity score distance. The caliper was set at 0.2 in accordance with the experimentally recommended range of 0.2 to 0.5 times the standard deviation of the logit of the propensity score to effectively control for variance.[6]

Surgical Technique

Patients were placed in the prone position utilizing gel padding. A transverse incision in line with the gluteal crease was made. The gluteal fascia was incised horizontally exposing the caudal edge of the gluteus maximus. The gluteus maximus was retracted proximally exposing the underlying hamstring sheath. Once the sciatic nerve was identified and protected, the hamstring sheath was divided longitudinally to expose the free end of the tendon. Proximally, the hamstring footprint on the ischial tuberosity was identified and cleared of any remaining soft tissue to provide for an adequate healing surface.

Double-loaded suture anchors (Qfix; Smith & Nephew) were inserted in an inverted triangle or diamond-shaped fashion depending on the size of the tear and the quality of the tissue. Sutures were passed through the hamstring tendon in a series of Krackow and modified Mason-Allen stitches. The pull sutures from the anchor were used to reduce the tendon to the bone and all the sutures were tied. After thorough irrigation, the gluteal fascia was closed. The subcutaneous and skin closure was performed with Monocryl (Ethicon Inc). An Aquacel dressing (Convatec Inc) was then placed. All patients were placed in a locked hip orthosis to restrict hip flexion postoperatively and kept toe-touch weightbearing for 4 weeks. During this time, patients were given apixaban 2.5 mg twice daily for venous thromboembolism prophylaxis. Formal physical therapy began 1 month postoperatively. Patients were instructed to ween out of the brace and begin gentle hip and knee range of motion at 4 weeks. Patients progressed to strengthening and nonimpact aerobic activities at 8 to 10 weeks. Patients were cleared for full activity without restrictions at 6 months.

Outcome Assessment

Comorbidity data were obtained through a medical chart review. The follow-up length was determined as the time

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between the date of the procedure and the date on which the telephone survey used to obtain PROs was completed.

The primary outcome measures were the postoperative scores on the following PROs: Lower Extremity Functional Scale (LEFS) percentage of maximal function (calculated as [(LEFS score/80] × 100); the Hip Outcome Score (HOS), comprising the Activities of Daily Living and Sports subscales; and the 12-Item Short Form Health Survey (SF-12) Physical Component Summary (PCS) and Mental Component Summary (MCS).

The secondary outcome was return to work data, which collected through medical chart review or postoperative surveys. Time to return was characterized as follows: (1) return to light-duty capacity—temporary or permanent work that was physically less demanding than normal job duties due to the inability to perform job functions after surgery—or (2) full-duty capacity—no restrictions in the ability to return to normal job function. The type of work was characterized in accordance with the national WC guidelines for lifting, carrying, pushing, and pulling. Light work is defined by a limit of 20 lbs (9.1 kg) occasionally, a limit of 10 lbs (4.5 kg) frequently, and negligible weight constantly. Medium work is defined by the requirement of 20 to 50 lbs (9.1-22.7 kg) occasionally, 10 to 25 lbs (4.5-11.3 kg) frequently, and a limit of 10 lbs (4.5 kg) constantly. Heavy work is defined as ≥50 lbs (≥22.7 kg) occasionally, ≥25 lbs (≥11.3 kg) frequently, and ≥10 lbs (≥4.5 kg) constantly.

Statistical Analysis

For continuous variables, descriptive statistics are expressed as the mean and standard deviation or the median and interquartile range; for categorical variables, as the absolute value and percentage. Univariate analysis was performed to determine differences in PROs between the WC and non–WC cohorts. The *t* test and the Mann-Whitney *U* test were used for continuous variables of normal and nonnormal distributions, respectively. Categorical variables were assessed using the chi-square test or the Fisher exact test, depending on the sample size. Statistical analysis was completed using R statistical software (R Core Team). Statistical significance was measured at an alpha level of .05.

RESULTS

Patient and Surgery Characteristics

When accounting for patient demographic characteristics, including age, sex, and BMI, the WC and non–WC cohorts were similar in terms of age, sex distribution, BMI, and follow-up time. There was also no difference in weeks from injury to surgery between non–WC and WC patients (Table 1). There was no difference between the work characterization (light, medium, or heavy) of non–WC and WC participants before surgery (Table 2). There were also no intraoperative or postoperative complications for either group.

TABLE 1
Demographic Information Between the WC and Non–WC Cohorts[a]

Parameter	WC Group (n = 10)	Non–WC Group (n = 20)	*P*
Age, y	58 ± 5.2	58 ± 9.1	>.99
Female sex	5 (50)	8 (40)	.706
BMI	28.4 ± 2.8	28.4 ± 2.9	.912
Follow-up, mo	57.2 ± 31	58.5 ± 32.4	.916
Time from DOI to DOS, wk	3.5 [2-6.5]	3.5 [2-11]	.894

[a]Data are represented as mean ± SD, n (%), or median [interquartile range]. BMI, body mass index; DOI, date of injury; DOS, date of surgery; WC, workers' compensation.

TABLE 2
Type of Work Stratified by WC Status[a]

Type of Work	WC Group (n = 10)	Non–WC Group (n = 18)[b]
Light	4 (40)	14 (77.8)
Medium	3 (30)	2 (11.1)
Heavy	3 (30)	2 (11.1)
P	.145	

[a]Data are represented as n (%). WC, workers' compensation.
[b]Two retired patients were excluded from this analysis.

Postoperative PRO Scores

HOS values (range, 0-100) were all comparable between the 2 groups. The LEFS percentage of maximal function was also found to be similar between the WC and non–WC cohorts. The SF-12 PCS (range, 24.0-56.6) did not differ significantly between groups; however, the WC cohort showed inferior SF-12 MCS scores (range, 19.0-60.8) compared with the non–WC group (49.28 ± 9.97 vs 54.26 ± 9.69, respectively; $P = .032$) (Table 3).

Time to Return to Work

The WC status significantly increased the amount of time needed for patients to return to full-duty work compared with the non–WC group (21 ± 9 vs 9 ± 8 weeks, respectively; $P = .005$); however, there was no difference in time to return to light-duty work between groups.

DISCUSSION

Overall, we found that patient outcomes on the LEFS, HOS, and SF-12 PCS did not differ between the WC and non–WC groups; however, scores on the SF-12 MCS did differ significantly ($P = .032$). In addition, WC patients were found to have longer return to work times for full-duty status compared with the non–WC cohort ($P = .005$).

PHR is a reliable operation for treating proximal hamstring avulsion, and a subset of patients who sustain proximal hamstring injuries qualify for WC.[7,9,11,18] Our finding

TABLE 3
Effect of WC Status on PHR Outcomes[a]

Parameter	WC Group (n = 10)	Non–WC Group (n = 20)	*P*
Return to work, wk			
Light duty	13 ± 14	10 ± 8	.688
Full duty	21 ± 9	9 ± 8	**.005**
Hip Outcome Score	91 ± 13	98 ± 4	.233
ADL	80 ± 34	93 ± 11	.754
Sports	89 ± 18	97 ± 5	.466
LEFS percentage of maximal function	84.75 ± 23.44	96.19 ± 7.03	.488
SF-12 Health Survey			
PCS	48.93 ± 9.16	52.33 ± 5.65	.521
MCS	49.28 ± 9.97	54.26 ± 9.69	**.032**

[a]Data are represented as mean ± SD. Bold *P* values represent statistically significant differences between groups ($P < .05$). ADL, Activities of Daily Living; LEFS, Lower Extremity Functional Scale; MCS, Mental Component Summary; PCS, Physical Component Summary; PHR, proximal hamstring repair; SF-12, 12-Item Short Form Health Survey; WC, workers' compensation.

of similar PRO scores in terms of physical outcomes is consistent with the study by Nicholson[16] who reported that both the WC and the non–WC groups experienced comparable and acceptable physical function scores after arthroscopic acromioplasty. However, there is substantial evidence that WC does affect outcomes.[2,3,5,10,13] We assessed patients, on average, 5 years after surgery; thus, it is possible that the prolonged follow-up time allowed for any initial differences in postoperative outcomes to equilibrate over time. WC patients commonly have injuries to the upper extremity and back. The difference seen in our study from others in the literature may be due to the type of injury and the degree of immobility postoperatively. The extent to which patient characteristics and clinical features explain differences in outcome between those with and without WC claims is unclear, and the mechanism for worse outcomes remains to be elucidated.

In the present study, patients with WC status had significantly lower SF-12 MCS scores than non–WC patients, despite comparable injury recovery. Decreased mental health status in WC patients is likely affected by various social and economic factors, external to and potentially exacerbated by a proximal hamstring injury, which delays return to work and puts stress on the employee-workplace relationship. This finding suggests that greater emphasis be placed on rehabilitation and mental health support for WC patients. Previous investigations have associated decreased mental health with income and employment insecurity after a workplace injury.[20] Sears et al[19] further emphasized the need for improvement in workers' experience within the WC system. There appears to be a trend in the literature capturing a mental health struggle for patients within the WC system. Mental and physical health are often linked, and recovery from injury must be considered holistically. Although we did not find differences in physical function scores, differences in postoperative mental health status suggest that there are factors beyond the physical injury contributing to surgical outcome.

We also found that WC patients experienced longer return to work times at a full-duty capacity than non–WC patients. Evidence for longer return to work times may help guide discussions between providers and patients, allowing for the clearer portrayal of expectations. Previous studies have corroborated this delayed return timeline for WC patients compared with non–WC patients.[8,14] This may contribute to the perception that there are poorer outcomes for patients receiving WC claims. Furthermore, patient reporting may be complicated by their unwillingness to try certain activities and fear of sustaining another hamstring injury.[21] A larger percentage of WC patients also performed heavy work (30% vs 11.1% for the non–WC group), which could have contributed to the longer time to return to work.

We found no significant differences in the level of workload (light, medium, or heavy) between the 2 cohorts. It has been hypothesized that WC patients generally experience inferior outcomes because of greater occupational demands, secondary gain, or reduced recovery time as well as differences in comorbidities, prior treatments, expectations, and educational levels.[13] Other studies[3,5,8,10] that evaluated WC patients and postoperative scores did not evaluate the work-demand level; however, Nicholson[16] determined that the work-demand level was greater for WC patients compared with non–WC patients undergoing arthroscopic acromioplasty. In our study, we found that WC patients return to their jobs after a significantly longer period of recovery compared with their non–WC counterparts (see Table 3). This difference may explain the comparable physical scores between groups. The economic implications of prolonged return to work time may also have contributed to the differences in mental health scores between groups. Furthermore, increased feelings of kinesiophobia related to their workplace—as a result of previous workplace injury and increased work intensity—may have contributed to the longer time to return.

There was no significant difference in the time between the date of injury and the date of surgery for WC and non–

WC patients. A study by Razmjou et al[17] concluded that expedited surgery led to improved PROs and work status after arthroscopic rotator cuff surgery. The lack of significant difference in PROs between our study cohorts may be supported by the absence of significant difference in time between injury and surgery.

Limitations

The major limitation of this study is the small sample size and wide range of follow-up. However, PHR is relatively a rare procedure. A large range in follow-up may dilute differences in outcomes at either shorter- or longer-term follow-up. Reported return to work date for non–WC patients may have been affected by recall bias. This study included only patients treated at a high-volume private practice, limiting the generalizability of the results. Surgery selection was performed by a single surgeon, which further limits generalizability, as surgical indications and the rate of surgery offering may differ between groups. The strengths of this study include the consistency in surgical technique and patient selection performed by the propensity score matching.

CONCLUSION

PRO scores after PHR for WC and non–WC patients differed significantly on mental health scoring tools; nonetheless, physical health assessments were similar between groups. More evidence is needed to determine associations relating to longer return to work times that have been repeatedly recorded. Furthermore, differences in surgery type and work demand levels for specific WC injuries may account for differences in study findings regarding postoperative outcome scores and WC status, and more research, specifically on hamstring injuries, is needed.

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