Factors Contributing to Failure of Rotator Cuff Surgery in Persons with Work-Related Injuries

Helen Razmjou, Sandra Lincoln, Terry Axelrod, and Richard Holtby

ABSTRACT

Purpose: Shoulder pain is a major musculoskeletal and economic concern in industrialized countries, with the rate of surgical failure reportedly higher in patients injured at work. The purposes of this study were (1) to examine the prevalence of identifiable causes of rotator cuff surgery failure and (2) to examine the relationship among the existence of these causes and outcome scores, patient expectations, and overall satisfaction.

Methods: This was a cross-sectional study of patients who experienced continued impairments following surgical treatment for work-related injuries. The primary outcome was a disease-specific measure, the Western Ontario Rotator Cuff (WORC) index. Patients were categorized into two groups based on the existence of an identifiable reason for surgical failure vs. no reason for failure, as demonstrated by clinical and radiologic investigations and decided upon by a shoulder surgeon and a physical therapist. Analyses included a *t*-test for independent sample means, linear regression, non-parametric Wilcoxon test, and Fisher's exact test.

Results: Thirty-eight consecutive patients were included in the study, and 24 causes of surgical failure were identified in 19 patients (50%). Overall, patients with findings of failure were more disabled according to the total WORC index and had higher levels of symptoms, emotional difficulties, and limitations in sports and recreational activities. Expectations and satisfaction levels were not significantly different between groups.

Conclusion: Our results indicate that 50% of patients who reported failed surgery had at least one reason to explain their ongoing symptoms, emotional difficulties, and functional limitations.

Key Words: rotator cuff, work-related, surgical failure, shoulder

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RÉSUMÉ

Objectif : Dans les pays industrialisés la douleur à l'épaule constitue une préoccupation majeure aux points de vue musculo-squelettique et économique, et l'on signale un taux d'échec chirurgical plus élevé chez les patients blessés au travail. Cette étude a pour but 1) d'examiner la prédominance des causes identifiables de l'échec chirurgical de la coiffe des rotateurs et 2) d'examiner le rapport entre l'existence de ces causes et les scores de résultats, les attentes des patients et la satisfaction générale.

Méthodes : Voilà une étude transversale des patients qui ont connu des incapacités continues suite à un traitement chirurgical pour un accident professionnel. Le résultat primordial a été une mesure spécifique à la maladie, l'indice de la coiffe des rotateurs de l'Ouest ontarien (Western Ontario Rotator Cuff [WORC] index). Les patients ont été catégorisés en deux groupes selon qu'ils avaient une raison identifiable d'échec chirurgical par rapport à aucune raison d'échec, tel que l'avaient démontré les investigations cliniques et radiologiques, et selon la décision d'un chirurgien de l'épaule et d'un physiothérapeute. Les analyses renfermaient un test *t* pour les moyennes d'échantillons indépendants, une régression linéaire, un test non paramétrique de Wilcoxon et la méthode exacte de Fisher.

Résultats : Trente-huit patients consécutifs ont été inclus dans l'étude. Vingt-quatre causes d'échec chirurgical ont été identifiées chez 19 patients (50 %). Dans l'ensemble, les patients qui avaient des résultats d'échec étaient plus incapacités selon l'indice total WORC et présentaient des niveaux plus élevés

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de symptômes, de difficultés émotionnelles et de limitations dans leurs activités sportives et de loisirs. Les attentes et les niveaux de satisfaction n'étaient pas considérablement différents entre les groupes.

Conclusion : Nos résultats indiquent que 50 % des patients ayant signalé un échec chirurgical avaient au moins une raison pour expliquer leurs symptômes continus, leurs difficultés émotionnelles et leurs limitations fonctionnelles.

Mots clés : coiffe des rotateurs, occupationnel, échec chirurgical, épaule

INTRODUCTION

Upper-extremity musculoskeletal impairments due to work-related injuries account for a significant percentage of lost work time and disability costs.¹⁻⁵ Some individuals whose shoulder rotator cuff disease is caused by repetitive overhead lifting may recover completely if the repetitive work is discontinued and appropriate non-surgical treatment is received.⁶⁻⁸ However, overhead activities are associated with abnormal alterations in rotator cuff tendons,⁹ and ongoing overhead and repetitive activities may cause recurrent episodes of pain and disability despite appropriate conservative treatment. Non-operative interventions do not appear to provide full recovery of function in all patients with significant pathology or full-thickness rotator cuff tears.¹⁰⁻¹² Surgical interventions may therefore be indicated to address ongoing pain and disability related to impingement and damage to the rotator cuff tendons for refractory cases that have exhausted conservative measures.

Surgical success in the field of orthopaedics depends on a number of factors. Reduced symptoms, improved activity limitation, and participation in normal life situations are factors that contribute to this success. The incidence of incomplete recovery from rotator cuff-related surgeries in the general population has been reported to range from 3% to 25%.¹³⁻¹⁸ After examining the cause of poor results following acromioplasty, Hawkins et al.¹⁵ reported that 34 of 51 (66%) of patients were found to have symptoms and signs corresponding to a recognized clinical diagnosis. In Post and Cohen's series,¹⁶ 72 patients with impingement syndrome were followed for 5 to 48 months; 37% had varying degrees of muscle weakness preoperatively. Of these, 71% were improved, 21% were unchanged, and 8% had a further decrease in range of motion (ROM) and strength post-operatively. Ogilvie-Harris et al.¹⁸ reported that a large percentage (82%) of 65 individuals who had ongoing pain and dysfunction after surgery had a physical reason (missed intra- or extra-articular pathology) to explain their symptoms. Factors that appear to contribute to surgical failure include inadequate soft-tissue decompression, larger size of rotator cuff tears, poor tendon quality, presence of significant preoperative weakness, osteoarthritic changes, cervical spondylosis, reflex sympathetic dystrophy, thoracic outlet syndrome, glenohumeral instability, and failed rehabilitation.¹³⁻²⁴

The impact of litigation on surgical outcome of injured workers remains controversial. Much of the debate regarding persistent pain revolves around the normal anticipated time for soft-tissue healing, which is usually around 6 to 8 weeks.²⁵ Secondary gains (receiving salary, benefits, or financial rewards without performing the required job) related to compensation may partially explain slower recovery for some patients injured at work. However, clinical experience and follow-up studies^{26,27} have demonstrated that regardless of settlement status, a significant subset of patients continues to report and experience chronic symptoms.

In terms of recovery following rotator cuff-related surgeries, most authors have reported inferior results in patients receiving compensation.^{15,16,28-32} Hawkins et al. reported that the success of a second surgical procedure was significantly lower in patients receiving worker's compensation.^{15,28} In their sample of 51 patients, 17 patients had no clear cause for their continuing shoulder discomfort.²⁸ Post and Cohen (56 injured workers out of 72 patients),¹⁶ Lopez et al. (12 injured workers out of 23 patients),²⁹ McKee and Yoo (23 injured workers out of 71 patients),³⁰ and Viola et al.³¹ (33 injured workers out of 57 patients with rotator cuff tears) also reported that injured workers had consistently lower scores based on pain and strength,¹⁶ the University of California Los Angeles (UCLA) Shoulder Rating Scale,²⁹ or the SF-36 general health questionnaire.^{30,31} Similarly, Misamore et al.³² examined 103 patients and reported a much lower incidence of good or excellent results (based on the UCLA score) among injured workers (54%) than in the non-compensation group (92%). However, the foregoing studies used heterogeneous samples, which may have led to overestimation of poor results in injured workers. In addition, lack of optimal improvement after surgery may be related to legitimate physical factors that may have gone undetected.¹³⁻²⁴ Work demands also play an important role in injured workers' successful return to work,³¹⁻³⁷ and, consequently, some authors^{34,36,37} have suggested that return to strenuous occupations^{34,37} or competitive athletic activities³⁶ following acromioplasty or rotator cuff repair may not be feasible for some patients. Iannotti et al.³³ reported that patients who were gainfully employed before surgery returned to the workforce after surgery, although at a lower activity level. In addition to identifiable causes of failure that may explain lack of full recovery of symptoms and function

following surgery, patients' expectations of treatment outcomes are important and need to be considered. Understanding these factors may provide more insight into the causes of slower recovery reported in the literature for this group.

The purposes of this study were (1) to examine the prevalence of identifiable causes of rotator cuff surgery failure and (2) to examine the relationship among the existence of these causes and outcome scores, patient expectations, fulfilment of such expectations, and overall patient satisfaction. Based on the literature,^{13–24} we hypothesized a moderate (50–80%) prevalence of identifiable causes of failure in patients with ongoing symptoms and disability. A positive correlation was expected between the existence of objective factors of failure and higher scores on pain and disability measures. Levels of expectations and their fulfilment were explored without any specific hypothesis. It was hypothesized that patients with physically identifiable findings that could explain their failure would report less satisfaction with surgery.

METHODS

Subjects

This was a cross-sectional study of individuals under 65 years old with work-related injuries. All patients were referred to a specialty programme for assessment of shoulder impairments following an unsuccessful (failed) surgical procedure. Failure was defined by the presence of at least two of the following criteria: (1) persistence of significant symptoms and functional disability following surgery, (2) patient's lack of recovery that affected a successful return to regular duties at work, and (3) consideration of additional treatment, including further surgery. These criteria were obtained from the referral letter of the nurse case manager, with supporting information from the family physician or treating physical therapist. To capture the majority of patients who are usually seen at the Workers' Compensation sub-specialty clinics – which are designed to provide a structured multidisciplinary assessment and treatment – the time period between initial surgery and inclusion in the study was approximately 1 to 5 years.

All patients completed a disease-specific outcome measure, the Western Ontario Rotator Cuff (WORC) index,³⁸ and an expectation/satisfaction questionnaire at their initial visit. Following a physical therapist's assessment, all patients were examined by one orthopaedic surgeon with sub-specialty interest in shoulder surgery (there were two surgeons involved in the study). Investigations conducted prior to the initial visit included one or more of X-rays, magnetic resonance imaging (MRI), computed tomography (CT) scan, and ultrasound. The previous treating surgeon's progress

note and operative report were reviewed. If the examining surgeon at the clinic felt that the prior investigations were not adequate, further investigations were ordered. At the end of the first session or the follow-up (in case of insufficient previous investigations), the assessing surgeon and the physical therapist completed a data-collection form in which the cause of failure was documented, based on the results of clinical examination and other investigations. All subjects provided informed consent. Approval for use of human subjects was obtained from the Research Ethics Board of the Sunnybrook Health Sciences Centre.

OUTCOME MEASURES

Western Ontario Rotator Cuff (WORC) Index

The primary outcome was the WORC index,³⁸ a disease-specific outcome measure. The WORC was chosen because of its ability to document symptoms, activity limitations (daily tasks, work, sports), and emotional difficulties in separate domains. The WORC consists of 21 items representing five domains (physical symptoms, sports/recreation, work, lifestyle, and emotions). Each item is scored on a visual analogue scale. Physical symptoms (600 points) account for approximately 29% of the total score. Sports and recreation (400 points), work (400 points), and lifestyle (400 points) each count for 19% of the total score, with the domain of emotions (300 points) counting for 14% of the total score.

The domain of physical symptoms includes sharp pain, nagging constant pain, weakness, stiffness, grinding and clicking, and neck pain. The domain of emotions concentrates on frustration and depression because of the shoulder and worrying about the effect of the shoulder on occupation. The domain of lifestyle addresses difficulty with sleeping, dressing or undressing, hair styling, and roughhousing with family or friends. The work domain deals with difficulty in performing daily activities, heavy lifting, overhead activities, and compensating with the opposite arm. The sports and recreational activity domain addresses concerns related to fitness level, performing push-ups, and throwing a ball. The most symptomatic raw score is 2,100; the best, or asymptomatic, score is 0. To present this information in a more clinically meaningful format, the score can be reported as a percentage of normal by subtracting the total from 2,100, dividing by 2,100, and multiplying by 100. Total final WORC scores can therefore vary from 0%, the lowest functional status level, to 100%, the highest functional status level. The WORC has been reported to have acceptable test-retest reliability and cross-sectional and longitudinal convergent/divergent validity in patients with rotator cuff disease.^{38–41}

Patient Expectation/Satisfaction Questionnaire

The expectation questionnaire asked patients about their preoperative expectations and postoperative expectation fulfilment with respect to pain relief, ROM, and conducting activities of daily living. Prior to the present study, a test-retest reliability study of the expectation questionnaire was conducted with 25 candidates for shoulder surgery. The results showed moderate reliability for the three questions used in the present study (pain, ROM, and activities of daily living), and weighted kappa values were 0.42 (CI: 0.03, 0.80) and 0.49 (CI: 0.2, 0.75) for expectations related to improved ability to perform activities of daily living and improved ROM. The kappa value could not be calculated for pain relief because of imbalanced rows and columns; however, there was 76% agreement between categories. This questionnaire has been reported to have discriminative validity in detecting different levels of physical and mental health and disability in patients awaiting total knee replacement.⁴² Two extra questions explored patients' retrospective decisions about undergoing surgery (no/yes) and their overall satisfaction with surgery (very satisfied, somewhat satisfied, a little bit satisfied, dissatisfied).

Based on the literature¹³⁻²⁴ and consensus among two surgeons and three physical therapists, reasons for failure were divided into nine different categories, including failed rehabilitation. Patients were then separated into two groups: (1) patients with an identifiable reason for surgical failure and (2) patients without a detectable reason for failure. Failure in rehabilitation was considered a potential reason for overall failure and was defined as a poor response to appropriate physical therapy, characterized by lack of progress reported by the treating physical therapist and findings of weakness or stiffness in the affected upper extremity. It was expected that some of the physical factors of failure would overlap.

Statistical Analysis

Descriptive statistics were calculated for all variables and responses related to expectations and their fulfilment. A *t*-test for independent sample means was used to examine the age differences between groups. The impact of age was examined using linear regression analyses, with age as the predictive factor and domains of the WORC index as dependent variables. Because of the high level of disability in this population, the scores of the WORC domains were not normally distributed (Kolmogorov-Smirnov statistics < 0.05), and, therefore, non-parametric tests (Wilcoxon two-sample test) were used to examine group differences. Categorical data analysis was used to examine the relationship between causes of failure and patient expectations, expectation fulfilment, and overall patient satisfaction. Statistical analyses were performed using SAS version 9.1 (SAS Institute, Cary, NC). Statistical results

are reported using two-tailed *p*-values, with significance set at *p* < 0.05.

RESULTS

Thirty-eight consecutive patients entered into the study within a period of 30 months: 9 women and 29 men, with a mean age of 48 years (SD = 7.97 years; minimum, maximum: 31, 63). Table 1 displays the demographic data for the study patients. The mean interval between surgery and assessment was 552 days (SD = 347 days; minimum, maximum: 254, 1,787). Twenty-four patients had had rotator cuff decompressions, and 17 had had rotator cuff repairs; 3 patients had had both procedures). Higher age was associated with a higher level of physical symptoms ($F_{1,37} = 9.38$, $p = 0.004$). Age did not predict scores in any other domain of the WORC.

In total, 19 patients had an identifiable reason for failure (24 physical reasons of failure were identified, and 5 patients had more than one diagnosis). Patients in the group with identifiable findings of failure (group 1) had 11 rotator cuff repairs, as compared to 6 in the other group (group 2). Table 2 shows the frequency of the physical findings that were thought to be contributing to failure

Table 1 Demographics of All Study Patients Based on History (*N* = 38)

Demographics	Frequency	%
Work Status		
Regular duties	1	3
Modified duties	7	18
Not working (related to shoulder)	29	76
Not working (related to other reasons)	1	3
Symptoms		
Night pain	30	79
Pain with movement	32	84
Weakness	19	50
Stiffness	21	55
Mechanism of Injury		
Fall	8	21
Direct blow	7	19
Repetitive injuries	8	21
Insidious onset	2	5
Traction injury	5	13
Other (forceful pushing, pulling)	8	21

Table 2 Frequency of Identifiable Causes for Failure (24 causes were identified in 19 patients)

Findings	Frequency	%
Large or massive tears	6	16
Fixation failure	4	11
Missed glenohumeral pathology	4	11
Reflex sympathetic dystrophy	3	8
Cervical spondylosis	2	5
Failure of rehabilitation	2	5
Osteoarthritis of the glenohumeral joint	2	5
Failure of deltoid reattachment	1	3
Shoulder instability	0	0

Table 3 Mean Scores of the Domains and the Total WORC in Two Groups

Domains/Total	Group 1 (n = 19) Identifiable Findings		Group 2 (n = 19) Non-identifiable Findings		Wilcoxon value p-value
	Maximum disability score	Mean (SD)	Maximum disability score	Mean (SD)	
Physical symptoms	600	491 (86)	600	426 (85)	449.00 $p = 0.03$
Work	400	353 (46)	400	327 (46)	435.50 $p = 0.07$
Lifestyle	400	347 (45)	400	308 (74)	433.50 $p = 0.08$
Sports activities	400	363 (36)	400	329 (40)	469.00 $p = 0.01$
Emotions	300	277 (26)	300	244 (48)	440.50 $p = 0.05$
Total WORC (raw)	2100	1934 (212)	2100	1743 (223)	464.50 $p = 0.01$
Total WORC*(%)	0 %	13% (15%)	0%	22% (16%)	275.50 $p = 0.01$

WORC = Western Ontario Rotator Cuff index

p-values are based on Wilcoxon two-sample test analysis

Total WORC*(%): Normal score is 100% and maximum disability is 0%.

of surgery. Age had equal variances in both groups and was not significantly different between the two groups (45.5 vs. 43.5, $p = 0.30$). The number of female and male patients was similar in both groups (5 women/14 men in group 1; 4 women/15 men in group 2). Work status was similar in both groups. In group 1, 74% were off work and 16% doing modified duties; in group 2, 79% were off work and 21% doing modified duties. Symptoms and mechanism of injury were not significantly different between groups ($p > 0.05$).

Overall, patients with identifiable causes of failure had significantly lower total scores on the WORC ($p = 0.01$). Table 3 shows the mean score of the domains in each group. The non-parametric two-sample Wilcoxon tests showed significant differences between groups in the domains of physical symptoms ($p = 0.03$), emotions ($p = 0.05$), and sports/recreational activities ($p = 0.01$).

Expectations, Expectation Fulfilment, and Overall Satisfaction

Table 4 shows the frequency of expectations and their fulfilment with respect to pain, ROM, and ability to perform daily activities. Existence of a physically identifiable reason for failure did not affect expectations, fulfilment of expectations, or overall satisfaction ($p > 0.05$). However, a significant difference was observed between scores for the emotions ($p = 0.037$) and lifestyle ($p = 0.014$) domains in patients who were completely dissatisfied and those who were slightly satisfied (a little bit satisfied). When asked, "If you could turn back the clock to prior to surgery, would you undergo the surgery again?" 20 patients (53%) reported that they would not have undergone surgery and 18 (47%) reported that they would have undergone surgery.

DISCUSSION

Most previously published data on injured workers have compared outcomes of patients on compensation with those of patients whose injury is not work related.^{15,16,28-31} In situations where social and psychological factors, expectations, work demands, and chronicity of the problems are not similar or controlled, the results of such a comparison would not appear positive for the compensation group. The strength of the present study was that it used a homogeneous sample of patients who were affected by similar factors, most importantly work-related injuries. Despite the high homogeneity of the sample, we found differences in the level of reported disability and physical findings among individuals.

In the present study, the frequency of identifiable causes of failure that were thought to contribute to patients' ongoing symptoms and disability was 63% (24/38); five patients had multiple identifiable causes of failure. This finding is fairly consistent with the previous literature, which reports a range of 56%¹⁶ to 82%.¹⁸ The number of rotator cuff repairs was higher in patients with an identifiable cause of surgical failure (58% vs. 31%). Patients in this group reported significantly higher levels of symptoms (pain, stiffness, and weakness), emotional disturbance (worry, depression, frustration) and difficulty in performing recreational and sports activities.

The term "secondary gain" has never been clearly defined; however, it usually refers to financial support that a worker may receive for as long as he or she remains disabled, which may be a factor in prolonging recovery in some cases. Previous studies^{15,28-32} have reported higher levels of ongoing symptoms and lower functional levels in injured workers, but factors that may have contributed to these findings are not explored. Hawkins et al.,^{15,28} in

Table 4 Descriptive Data Related to Patients' Expectations, Their Fulfillment and Satisfaction with Surgery (*N* = 38)

Question	Response	Frequency	(%)
Did you expect your surgery to help with pain relief?	No	0	0
	Yes, a little bit	1	2
	Yes, somewhat	9	24
	Yes, a lot	28	74
Has your surgery helped with pain relief?	No	25	66
	Yes, a little bit	6	16
	Yes, somewhat	7	18
	Yes, a lot	0	0
Did you expect your surgery to increase your pain-free range of motion? (Missing 2 responses)	No	0	0
	Yes, a little bit	0	0
	Yes, somewhat	12	33
	Yes, a lot	24	67
Has your surgery increased your pain-free range of motion?	No	25	66
	Yes, a little bit	8	21
	Yes, somewhat	3	8
	Yes, a lot	2	5
Did you expect your surgery to improve your ability to carry out the normal activities of daily living? (Missing 1 response)	No	0	0
	Yes, a little bit	1	3
	Yes, somewhat	9	24
	Yes, a lot	27	73
Has your surgery improved your ability to carry out the normal activities of daily living?	No	29	76
	Yes, a little bit	6	16
	Yes, somewhat	2	5
	Yes, a lot	1	3
How satisfied are you overall with the results of your surgery?	Very satisfied	0	0
	Somewhat satisfied	2	5
	A little bit satisfied	13	34
	Dissatisfied	23	61
If you could turn back the clock to prior to surgery, would you undergo the surgery again?	No	20	53
	Yes	18	47

examining injured workers who had undergone primary acromioplasties, reported a much higher level of unsatisfactory results compared with other cases. Misamore et al.,³² who evaluated 103 consecutive patients after primary repair of the rotator cuff, reported suboptimal recovery as measured by UCLA scores in injured workers. In that study, 42% of injured workers returned to full activity, as compared with 94% of a non-compensation group. Lopez et al.²³ report significantly different post-operative results, in terms of pain, function, and strength of forward flexion, in patients receiving workers' compensation. Post and Cohen¹⁶ observed that worse results were obtained from surgery performed for work-related than for non-work-related impingement syndrome and that patients covered by workers' compensation had a significantly lower self-assessed shoulder function than those patients who were not covered. In agreement with the foregoing studies, McKee and Yoo³⁰ reported that although operative treatment of rotator cuff disease led to improved scores on average, patients who had filed a workers' compensation claim had lower limb-specific and SF-36 scores both preoperatively and postoperatively. Although delay in returning to work after surgery in injured workers may be related in part to the potential impact of secondary gain, the above studies failed to examine the possibility of residual physical limitations (i.e., in strength or ROM), missed pathologies, and job demands that could affect patients' desire to return to their previous work.

Investigators who have reported favourable treatment results in the injured worker population have paid more attention to factors that may account for the discrepancy in response to treatment between this group and the general population. Nicholson,³⁷ who specifically compared work-related and non-work-related injuries, considered the impact of work-demand level and the presence of associated intra-articular pathologic changes on outcome scores and time to return to full-duty work. Nicholson's study found no significant difference in mean postoperative outcome scores between the workers' compensation and non-workers' compensation groups. However, the study did find a significant difference between groups in the average time to return to full-duty work. Interestingly, the injured workers had relatively heavier work-demand levels, which justified the delayed return to work; Nicholson³⁷ was able to show that the time to return to full duty was affected by work-demand level and not by compensation status. Frieman and Fenlin³⁴ also reported that the reason injured workers took a longer time to return to work was their involvement in heavy labour, which demanded a more complete return of shoulder function. In 2001, Hawkins et al.³⁵ reported no difference between workers' compensation cases and other patients who had received arthroscopic subacromial decompression at 2 years post-surgery. Iannotti et al.³³ reported that patients who were employed before surgery returned to the workforce after surgery, at least to modified duties, and that neither

preoperative activity level nor the presence of a worker's compensation claim adversely affected the postoperative Constant-Murley score. Therefore, it appears that satisfactory pain relief and return to pre-injury work activities can be achieved by acromioplasty or rotator cuff repairs in patients who may have a potential secondary gain.

The majority of the patients in our study expected a high level of pain relief, improved ROM, and physical activity (Table 4). Such expectations may not be realistic in situations where pathology is severe (i.e., massive tears) or in the presence of other associated comorbidities. Most importantly, surgeons may not be giving injured workers a realistic prognosis in relation to return to work and persistence of symptoms following surgery.

In terms of overall satisfaction with treatment, it has been noted that, in the general population, satisfaction and outcome are not necessarily linearly related.^{43,44} Williams et al.⁴³ reported that patients may express full satisfaction despite a negative outcome or failure to achieve a cure; the opposite may occur if a patient is anxious about returning to the same job that caused the problem in the first place. This phenomenon may be observed more frequently in older patients, who have less flexibility with respect to finding a suitable occupation. In general, satisfaction is a complex concept related to factors such as lifestyle, past experiences, and expectations as well as to both individual and societal values.^{43,44} It is consistent with the above theory that older patients in our study reported more symptoms of pain, weakness, and stiffness. In addition, the level of satisfaction reported was not directly affected by the existence of an identifiable cause of failure.

Workers who are required to sustain prolonged overhead postures or constantly move heavy weights are at risk for impingement and rotator cuff pathology.^{3,45} Whereas a patient may return to a sedentary lifestyle and feel that he or she has had a good response to treatment, the same patient, on returning to work with repetitive use of the arm, may continue to experience symptoms.^{33,34} On the other hand, compensation-related issues are expected to affect the natural history and prognosis of musculoskeletal problems.^{15,16,28–32} Patients who are at highest risk of continuous disability are typically those in lower socio-economic groups, particularly those who are older, are less educated, lack transferable skills, and are more likely to perform heavy or repetitive physical labour.⁴⁶ These factors and the possibility of residual legitimate factors should be taken into consideration by physicians and physical therapists involved in treating injured workers. Physical therapists should consider that persistent symptoms or functional disability after surgery might indeed be related to an identifiable cause of surgical failure. Injured workers who continue to report significant disability without any identifiable factors may require a multidisciplinary approach, including

detailed assessment of psychosocial issues, expectations, and job-related concerns.

LIMITATIONS

This study involved 38 consecutive patients with ongoing symptoms and disability treated at one centre over a period of 2.5 years. A larger sample of patients seen in multiple clinics would be more representative of injured workers who experience persistent problems following surgery. The lack of discriminant validity of the expectation questionnaire may be related to the limited number of questions, which did not cover the full spectrum of expectations related to recovery or unrealistically high expectations in injured workers. The cross-sectional nature of the study limits conclusive assessment of a cause-and-effect relationship between surgery and ongoing disability. Further studies, preferably longitudinal studies with larger samples, are required to examine the frequency of identifiable causes of failure following shoulder surgery. In addition, it would be of interest to investigate the prevalence of the same identifiable causes of failure in a non-compensation population and in those who feel they have had an acceptable outcome.

CONCLUSIONS

The results of this study indicate that 50% of injured workers with ongoing symptoms and difficulties following a rotator cuff-related surgery had at least one identifiable cause of failure that could explain their ongoing problems. Our findings also suggest that lower WORC scores may indicate the presence of such identifiable causes of failure.

KEY MESSAGES

What Is Already Known on This Subject

Previous literature has investigated the outcome of rotator cuff surgery in combined cohorts of patients with work-related and non-work-related injuries. Because social and psychological factors, as well as expectations, work demands, and chronicity of the problems, are not similar in these two groups, the results do not appear positive for the group of patients receiving compensation for work-related injuries.

What This Study Adds

This study investigated a homogeneous sample of patients who were affected by similar factors, most importantly work-related injuries. This study provides evidence that residual complaints following surgery in

injured workers may be legitimate and related to identifiable physical reasons.

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