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Risk factors for rotator cuff syndrome and shoulder pain in the working population

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Aims

The 12-month prevalence of shoulder pain in the population of working age ranges between 7 and 47%¹ and for clinically-diagnosed rotator cuff syndrome (RCS) ranges between 2 and 7%²⁻³. Information on the risk factors for shoulder disorders and clinically-diagnosed RCS in the working population would help policy makers to implement preventive intervention in the workplace.

The surveillance program for musculoskeletal disorders implemented in the Pays de la Loire region by the French Institute for Public Health Surveillance between 2002 and 2004 provides the possibility of epidemiological analysis of the risk factors for unspecific shoulder pain and clinically-diagnosed RCS in a large study sample exposed to various levels of work-related constraints³.

The aim of this study was to describe associations between the personal and occupational risk factors for unspecific shoulder pain and RCS and to compare their relative importance in a large sample of workers representative of the regional working population.

Methods

This cross-sectional study included 3,710 workers (58% men and mean \pm SD age 38.7 \pm 10.3 years) between 2002 and 2004.

Subjects with unspecific shoulder pain were defined as those who reported shoulder pain during the preceding 12 months, and RCS was diagnosed by 83 trained occupational physicians performing a standardized physical examination.

Personal factors and medical history were collected during the physical examination. Exposure regarding work status and occupational risk factors were assessed with a self-administered questionnaire including information on the characteristics of the job and tasks, work organization, and the main potential risk factors for RCS. Psychosocial work factors were assessed according to the Karasek Job Content Questionnaire.

Relationships between RCS and risk factors were studied by binary logistic regressions following a 3-stage process:

- In stage 1, univariate analyses were performed with each of the potential explanatory variables as independent variables and RCS as the dependent variable. Non-significant variables ($p > 0.20$) were excluded from further analyses, with the exception of age and gender.
- In stage 2, the independent variables not excluded in stage 1 were grouped into the five groups of potential determinants (personal factors, current occupational category and length of service in current job, factors related to work organization, postural and biomechanical constraints, and psychosocial factors at work). Backward multivariate logistic regression models were then performed for each group of variables, with age and gender forced into the models. Non-significant variables ($p > 0.10$) after this stage were excluded.
- In stage 3, final multivariate logistic regression analyses were performed using all variables remaining after stage 2, and backward selection retained only significant variables at a p -level of 0.05.

The same binary logistic regression modeling was performed for unspecific shoulder pain.

Multinomial logistic regressions were then constructed to determine which factors were associated with shoulder pain and/or RCS.

Three categories of outcome were defined:

- No shoulder pain and no RCS (reference)
- Shoulder pain alone
- Shoulder pain with RCS

The independent variables included in the model comprised all remaining variables of binary logistic regressions and only significant variables with a p -level at 0.05 were included in the final model.

Results

Prevalence of shoulder pain and RCS

- 29.3% of workers had shoulder pain alone
- 7.4% had shoulder pain with RCS

Risk factors for shoulder pain and RCS

The final multinomial logistic models highlighted 9 personal, organizational, biomechanical and psychosocial risk factors (Table).

Table. Multinomial logistic model for risk factors for shoulder pain and RCS in the whole working population

	Shoulder pain alone (n=1,016) ^(a)		Shoulder pain with RCS (n=257) ^(a)		p ^(b)
	OR	95% CI	OR	95% CI	
Women	1.3	[1.1-1.5]	1.4	[1.1-1.9]	NS
Age					
< 35	1		1		
35-44	1.2	[1.0-1.5]	3.4	[2.3-5.2]	***
45-54	1.6	[1.3-2.0]	6.2	[4.2-9.3]	***
≥ 55	1.6	[1.1-2.2]	7.0	[4.1-12.2]	***
Coexisting epicondylitis	1.7	[1.0-2.9]	3.6	[2.0-6.6]	**
Coexisting carpal tunnel syndrome	1.9	[1.2-3.0]	2.7	[1.5-4.9]	NS
Work pace dependent on an automatic rate	1.5	[1.2-1.9]	1.3	[0.9-2.0]	NS
Repetitiveness					
Never	1		1		
< 2 h/day	1.1	[0.9-1.4]	0.9	[0.6-1.5]	NS
2 to 4 h/day	1.3	[1.0-1.7]	1.3	[0.8-2.0]	NS
> 4 h/day	1.3	[1.1-1.6]	1.9	[1.4-2.7]	*
High physical demand ^(c)	1.4	[1.1-1.6]	1.7	[1.3-2.3]	NS
Sustained or repeated arm posture in abduction (≥ 2 h/day)					
No	1		1		
60° - 90° (moderate)	1.4	[1.1-1.8]	1.3	[0.8-2.1]	NS
> 90°	0.9	[0.7-1.2]	1.8	[1.1-2.7]	**
Both	1.5	[1.1-2.1]	2.7	[1.7-4.4]	*
Low supervisor support	1.4	[1.2-1.6]	1.5	[1.1-2.0]	NS

^(a) Reference group: n=2,217

^(b) Equality of two odds ratios (Shoulder pain alone / Shoulder pain with RCS):

*, $p < 0.05$, **, $p < 0.01$, ***, $p < 0.001$.

^(c) RPE Borg scale ≥ 13

A strong relationship was observed between age and RCS and, to a lesser extent, with shoulder pain. The ORs were significantly higher for shoulder pain with RCS than for shoulder pain alone for each age group. Female gender, the coexistence of clinically-diagnosed epicondylitis and carpal tunnel syndrome were associated with shoulder pain and RCS. No association was observed with overweight or obesity.

Work pace dependent on an automatic rate was associated only with shoulder pain.

A dose-response relationship was found with daily exposure to the high repetitiveness of tasks, with ORs ranging from 1.1 to 1.3 for shoulder pain and 0.9 to 1.9 for RCS. The differences between ORs for shoulder pain with and without RCS were significant only for repetitiveness of tasks for more than 4 hours per day.

High physical demand was associated with shoulder pain and RCS.

Moderate arm abduction (between 60° and 90°) for 2 hours or more per day was associated with shoulder pain alone whereas greater abduction (over 90°) was related to shoulder pain with RCS. The combination of sustained or repeated arm abduction over 60° and 90° was associated with shoulder pain and RCS. The ORs for abduction over 90° and the combination of moderate abduction and greater abduction were significantly higher among workers with RCS.

Examination of exposure to psychosocial factors at work revealed that low supervisor support was related to shoulder pain and RCS.

Conclusion

This study showed that personal and work-related biomechanical and psychosocial factors were associated with both shoulder pain and RCS. Factors related to work organization were only associated with shoulder pain. The relative importance of age was greater than that of work-related risk factors for both disorders and it was more strongly associated with RCS than with shoulder pain. However, most personal factors are less modifiable or preventable than work-related factors, and the latter should therefore be an important target for strategies aimed at the prevention of RCS and shoulder pain in the working population.

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