Editorial

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Increasing evidence of physical loads as risk factors for specific shoulder disorders

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Increasing evidence of physical loads as risk factors for specific shoulder disorders

Adequate function of the shoulder is crucial for many work tasks and activities of daily living. Nevertheless, shoulder pain is a common musculoskeletal complaint in the adult population, ranking third after low-back and neck pain. In Finland, every fifth adult reports shoulder pain during the past month, and on physical examination the prevalence of chronic shoulder syndrome has been estimated at 5.3% in the right and 3.2% in the left shoulder (1). Degenerative changes in the tendons of the rotator cuff are the most common pathological cause of shoulder problems, and rotator cuff tendinitis [also known as rotator cuff syndrome or subacromial impingement syndrome (SIS)] is the most common clinically defined entity, with a prevalence of 3.8 % in a representative adult population (2).

Systematic reviews are needed to synthesize existing evidence on risk factors. So far, no reviews have been carried out on the work-related risk factors of specific shoulder disorders. Appearing in this issue of the *Scandinavian Journal of Work, Environment & Health*, van Rijn et al's (3) systematic review summarizes data from 17 studies on specific shoulder disorders: 14 cross-sectional, 1 case control and 2 prospective studies. Almost half of the studies were found to be of high quality. Most studies had used SIS (or rotator cuff tendinitis or rotator cuff syndrome) as the outcome. Seven studies assessed physical workload, such as force, repetitiveness and posture, and their combinations, or hand–arm vibration, whereas ten studies contained information on occupation only as a proxy for physical loading. Only three studies addressed psychosocial workload factors.

The results show associations between SIS and force exertion, repetitiveness, elevated-arm postures, and the use of a vibrating tool. The associations were in general stronger for combinations of exposures than for individual exposures. It is encouraging to see that the quality of the studies has improved over time. Especially during the last decennium, several larger and methodologically stronger epidemiological studies have been published. However, a wide variability in assessment (particularly of exposures) precluded pooling of the data.

The methods of exposure assessment were perhaps the most uniform for upper-arm posture. Two studies had chosen 90° as the cut-off point for severe flexion or elevation of the arm (4–5), which comes close to the self-assessed "working with hand above shoulder" of a third study (6). A dose–response relationship was found for SIS and the percent of time spent with arms elevated during work as well as the cumulative duration in years of exposure to work-related upper-arm elevation. Using an inclinometer, Svendsen et al (4) found an association for 6–9% of proportional duration of working hours with upper-arm elevation, a result that was not very far from Punnett et al's (7) earlier finding of a clearly increased odds ratio for >10% of upper-arm flexion (>90°). Of note in these studies is that the assessment of both the exposure and the outcome were based on objective measures. The latter paper was not included in the review of van Rijn et al, probably because the outcome was based on symptoms and at least one physical finding and was not labeled as either rotator cuff tendinitis or SIS. A study by Silverstein (8) suggests that even lower angles (>45°) of upper-arm flexion – when combined with forceful exertion of the hand – are associated with rotator cuff syndrome. It is well-known from biomechanical studies that the torque of the shoulder joint increases rapidly after 30° of shoulder elevation. Measurements of intramuscular pressure show likewise an increase after 30° of elevation to the extent that blood supply of the supraspinatus and insfraspinatus muscle (and tendon) is compromised.

Only a minority of the studies included in Rijn et al's review had addressed work-related psychosocial factors. Job demands were associated with SIS in one study (4), and in another study in the uni- but not multivariable analysis (6). In the latter study, using a representative population sample of actively working subjects, the analysis showed that the determinants of specific and non-specific shoulder outcomes were very different, with physical load factors, age, and diabetes showing associations with rotator cuff tendinitis, while the associations with non-specific shoulder pain were modest and seen also for psychosocial and individual psychological factors.

Due to the inclusion of only a few prospective studies in the review, the authors concluded that the causality of the associations found could not be established. The question arises about the likelihood that there was reverse temporality between the exposures and the shoulder outcomes (ie, the physical workload factors would not have preceded the shoulder outcome). Subjects with shoulder pain or disorders are not likely to seek physically loading tasks, and they would also rather self-select out of such tasks than stay and continue to suffer from the pain. Therefore, it is likely that the exposures preceded the outcome, and primary and secondary selection mechanisms would rather have attenuated the associations.

A spurious association may also be found in cross-sectional studies, in which exposure assessment has been based on a subjective evaluation, if those with symptoms assess their exposure as higher compared to those without. However, three of four larger population studies that based their exposure assessment on generic risk factors, used objective and blinded assessment (4, 8, 9), and the risk estimates were in general not lower in these studies compared with those in which the exposure was based on subjective assessment.

Causality of associations is further supported by the findings of a recent long-term prospective study, indicating that exposure to repetitive movements and vibration, as well as lifting heavy loads at baseline, increased the risk of a chronic shoulder disorder 20 years later (10). The effects seem to be persistent, since they were seen even after retirement age. Due to the difference in the used outcome, this study was not included in van Rijn et al's review.

This latest review adds to the evidence of the role of work-related physical load factors in specific shoulder disorders. Additional evidence – supporting the role of mechanical loads – is the finding of a higher prevalence of rotator cuff tendinitis in the dominant compared to non-dominant shoulder in a large population study (2). This difference appears at an early working age and can be seen after retirement, suggesting also persisting effects of mechanical factors. Persistency of rotator cuff tendinitis was observed also in a study on the natural course of rotator cuff tendinitis in a working population, indicating that a third of cases of clinical stage rotator cuff tendinitis are persistent for at least one year (11).

Traumas from accidental injuries, typically falls, are a major contributing factor to the burden of diseases in the shoulder. A fall of a young person may result in a fracture of a bone, but the typical injury among ageing subjects is a tear in some part of the rotator cuff tendon. Minor tears may not be diagnosed, heal incompletely, and later manifest with a clinical picture of SIS.

Shoulder disorders – like many musculoskeletal disorders – are the result of the effects of individual and environmental factors. Rotator cuff tendinitis is rare before the age of 40 years. Its prevalence increases sharply with age, being double among subjects in their 40s and quadruple for those in their 50s compared to 30s (6). There is no major gender difference in the prevalence of rotator cuff tendinitis; however the effects of lifting heavy loads and combined exposures seem to be stronger among women compared with men (6, 10, 12). Lifestyle and metabolic factors seem to play a role in rotator cuff tendinitis (13). They may affect the resilience of the rotator cuff tendons to physical loads, and even resistance to the traumatic effects of accidental injuries, but so far little is known about such joint effects. However, shoulder disorders, of which a major proportion manifests as fairly easily diagnosable clinical entities, are a fruitful object for further research to increase our understanding of causation and prevention potential.

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