



IIAC

THE INDUSTRIAL INJURIES ADVISORY COUNCIL

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**Epicondylitis and occupational
activity**

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Epicondylitis and occupational activity

Summary

1. This report updates a previous review by the Industrial Injuries Advisory Council (IIAC) on the upper limb condition epicondylitis and its relationship to work.
2. In all, some 19 research reports have been considered in this review, many of which are new since the Council's last inquiries. Risk estimates have been published both in relation to occupational title and occupational activities.
3. Evidence was found of elevated risks, and in many reports these reached the threshold at which prescription of disease would normally be considered.
4. A deficiency in the evidence base, however, is that few studies have used the same definition of occupational exposure – be it in terms of a job title or a set of work activities. After much consideration, the Council has concluded that it would be unsafe to conjecture an exposure definition for the purposes of prescription and therefore prescription cannot be recommended.
5. The Council encourages further research on work and epicondylitis and would be pleased to receive fresh evidence. To inform decisions about prescription, such research should adopt a more harmonised approach to exposure definitions.

This report contains some technical terms, the meanings of which are explained in a concluding glossary.

Introduction

6. In 2014, IIAC received a request to reassess the evidence concerning occupation and the risk of a rheumatic condition of the elbow area called 'epicondylitis'.
7. The case for prescription was last considered in 2006 in the Command Paper, *Work-related Upper Limb Disorders* (Cm 6868), but since then new research evidence has emerged. This position paper provides further details and an update on the Council's position following further assessment of the evidence.

The Industrial Injuries Scheme and the requirements for prescription

8. IIAC is an independent statutory body that advises the Secretary of State for Work and Pensions in Great Britain and the Department for Social Development in Northern Ireland on matters relating to the Industrial Injuries Scheme. Industrial Injuries Disablement Benefit (IIDB) provides compensation that can be paid to an employed earner because of the effects of an industrial accident or prescribed disease.
9. The Social Security Contributions and Benefits Act 1992 states that the Secretary of State may prescribe a disease where he/she is satisfied that the disease:
 - ought to be treated, having regard to its causes and incidence and any other relevant considerations, as a risk of the occupation and not as a risk common to all persons; and
 - is such that, in the absence of special circumstances, the attribution of particular cases to the nature of the employment can be established or presumed with reasonable certainty.
10. In other words, a disease may only be prescribed if there is a recognised risk to workers in an occupation, and the link between disease and occupation can be established or reasonably presumed in individual cases.
11. In seeking to address the question of prescription for any particular condition, the Council first looks for a workable definition of the disease. It then searches for a practical way to demonstrate in the individual case that the disease can be attributed to occupational exposure with reasonable confidence. For this purpose, reasonable confidence is interpreted as being based on the balance of probabilities according to available scientific evidence.
12. For some diseases attribution to occupation may be possible from specific clinical features of the form of the disease, or of the circumstances of the individual case – for example, because such a disease only occurs at work.

Other diseases are not uniquely occupational, and when caused by occupation, are indistinguishable from the same disease occurring in someone who has not been exposed to a hazard at work. In these circumstances, attribution to occupation on the balance of probabilities depends on epidemiological evidence that work in the prescribed job, or with the prescribed occupational exposure, increases the risk of developing the disease by a factor of two or more. (The rationale for this has been explained in detail in previous reports of the Council.)

What is epicondylitis?

13. The condition exists in two forms, depending on the part of the elbow which is affected. **Lateral epicondylitis** (otherwise known as ‘tennis elbow’) is a condition in which the outer part of the elbow (lateral epicondyle) becomes painful and tender. This fairly common rheumatic disorder occurs mostly in patients aged 30 to 50 years.
14. Symptoms may arise from unaccustomed, forceful, repetitive use of the muscles that extend the fingers and wrist. Up to 50% of athletes in racquet sports may suffer from tennis elbow at some stage. However, cases occur in people who do not participate in such sports. Sometimes these appear related to jobs that require repetitive vigorous use of the forearm muscles, but cases also arise in the absence of a recognizable provocative activity. For this reason, in assessing the case for prescription, the Council has sought evidence on a doubling or more of risks in relation to work activity.
15. Affected individuals often complain of severe, burning pain over the outer elbow, which can spread to the forearm. The pain, which may worsen over weeks or months, is aggravated by gripping or lifting even light objects.
16. Even with treatment, the pain of lateral epicondylitis may persist for several months.
17. In **medial epicondylitis** (‘golfers elbow’) pain occurs instead at the origin of the flexors on the medial epicondyle of the humerus (inner aspect of the elbow). The pain is made worse by bending (flexing) the wrist. As with tennis elbow, some cases can be linked with recreational activity and symptoms tend to be persistent.
18. In research, case definitions of the disease have increasingly become standardised (Harrington *et al.*, 1998; Palmer *et al.*, 2000; Sluiter *et al.*, 2001), such that nowadays many studies use comparable diagnostic criteria. For purposes of compensation, however, the criteria in use are relatively subjective (e.g. self-reported tenderness).

Previous evidence

19. The Council's previous report (Cm 6868) drew on the evidence from a specially convened expert workshop and a commissioned review on work-related disorders of the upper limb.
20. Research studies of the time tended not to differentiate between medial and lateral epicondylitis. Considering either or both, the commissioned review found only limited evidence that would inform the case for prescription – in all, six reports (two of which were reports from the same research cohort) which assessed risk by occupational title, two more that provided risk estimates according to the nature and extent of occupational activities, and two based on claims activity (which were considered uninformative for the purposes of this review).
21. The strongest case was found for meat cutters. Three research papers were identified, in all of which relative risks (RRs) were more than doubled (the threshold the Council normally applies in considering prescription). Two of these, a cross-sectional survey by Viikari-Juntura *et al.* (1991) and a follow-up survey by Kurppa *et al.* (1991) were based upon the same study population and setting. A smaller cross-sectional study by Roto *et al.* (1984) also estimated a high RR in meat cutters in comparison with construction foremen (RR>6.0). The Council felt, however, that this evidence base was relatively small and not sufficient by itself to justify prescription.
22. The two Finnish studies also investigated sausage makers and meat packers. Among workers from the former occupation, risks were elevated both cross-sectionally (Odds Ratio (OR) 2.4) and longitudinally (incidence rate ratio 10.3); but for packers, the findings were inconsistent between studies. A French study (Leclerc *et al.*, 2001) also reported a far higher prevalence of epicondylitis in packers than in cashiers, although not dissimilar to that in various other groups involved in clothing, food, or assembly work.
23. Completing the studies of risk by occupational title were a solitary report of elevated RR in nursery school cooks versus social welfare workers (Ono *et al.*, 1998) and another isolated report in which Italian foresters had a RR of about 5 in comparison with a mixed population of blue-collar workers (Bovenzi *et al.*, 1991).
24. Regarding risks by occupational activity, a case-control study based on cases from general practices in Denmark found positive associations (RR>2) with various activities performed for three-quarters or more of the time vs. never/almost never – namely, arms lifted in front of the body, hands bent or twisted, same movements of the arm, and work requiring precise movements (Haahr *et al.*, 2003). A relation was also found to use of hand-held vibratory tools in men, but with an inconsistent exposure-response relationship.

25. The study by Leclerc *et al.* reported that risks were more than doubled for jobs that involved repetitive turning and screwing (based upon the range of jobs mentioned in paragraph 22).
26. The Council decided that, in sum, the evidence presented was not sufficient to define clearly the exposure schedule for prescription, and hence that epicondylitis should not be added to the list of diseases for which IIDB is payable.

Current investigations

27. IIAC referred the matter to its permanent sub-committee, the Research Working Group, which conducted a literature search and reviewed relevant research reports. In addition to a general search regarding epicondylitis and occupation, searches were made specifically for reports on risks in podiatrists (the occupation to which the original inquiry related) and in meat cutters (the occupation with the largest prior evidence base).
28. These inquiries have identified a substantial number of new reports on risk by activity and a few new reports by job title since the Council's last review.

Risks by job title

29. In all, four new cross-sectional studies were found on risks by job title, one of which focussed on lateral epicondylitis in poultry workers (Rosenbaum *et al.*, 2013), and the remainder of which reported risks for both lateral and medial disease in coal miners, coopers and doner kebab chefs respectively (Ozdolap *et al.*, 2013; Macdonald *et al.*, 2006; Taspinar *et al.*, 2014). Prevalence rates were somewhat higher in the poultry workers than in a comparison group (6.6% vs. 4.9%, probability (P) >0.05); lateral, but not medial epicondylitis was more common in coal miners than age-matched clerical workers (prevalence ratio (PR) 2.5, P<0.05), and in doner kebab chefs in comparison with volunteers (PR 6.0, P<0.05); while the RR in coopers was elevated >8-fold (P<0.05) relative to non-coopers. No evidence was found on risks in podiatrists.
30. In considering this part of the evidence base, the Council has identified a number of potential weaknesses in individual studies. More limiting, however, is the small evidence base for any given occupation. The situation here is unchanged from the Council's previous review.

Risks by occupational activity

31. Additionally, nine new reports were identified on lateral epicondylitis risks by occupational activity, of which five also reported on risks of medial epicondylitis.
32. These comprised a further cross-sectional analysis of the poultry workers mentioned in paragraph 29 (Arcury *et al.*, 2014); a cross-sectional study in assembly and electronic workers from Thailand (Pullopdisakul *et al.*, 2013); two large cross-sectional surveys of the general populations of Finland (Shiri *et al.*, 2006) and England (Walker-Bone *et al.*, 2012); an analysis which pooled earlier cross-sectional data from multiple studies in mixed occupations (Nordander *et al.*, 2009); and several cohort studies that sampled across a range of jobs and industries (Herquelot *et al.*, 2013, Descatha *et al.*, 2013, Garg *et al.*, 2014, Fan *et al.*, 2014). Sample sizes in these studies ranged from several hundred (e.g. Arcury *et al.*, Garg *et al.*, Pullopdisakul *et al.*, Descatha *et al.*) to several thousand (e.g. Shiri *et al.*, Walker-Bone *et al.*, Nordander *et al.*).
33. Collectively these presented many estimates of risk, especially for lateral epicondylitis. Almost half of these estimates reached the threshold of a doubling in risks that is normally applied within the Scheme.
34. For example, in a study of 699 US workers from various industries, followed over about 3 years, lateral epicondylitis was associated with bending the wrist for 4 or more hours per day (OR 4.4); rotation of the wrist for 4 or more hours per day (OR 2.7); and the combination of wrist bending for 4 or more hours per day and wrist rotation for 2 or more hours per day (OR 2.5, $P < 0.05$) (Descatha *et al.*, 2013). In another cohort study that followed 536 workers from 10 production facilities in the US, a high 'strain index' (as judged by video evidence) carried a 2.6-fold higher risk of lateral epicondylitis (Garg *et al.*, 2014). In a survey of over 6,000 adults from general practices in Hampshire, repetitive bending and straightening of the elbow appeared to increase the odds of lateral epicondylitis by 2.5-fold and medial epicondylitis by more than 5-fold (Walker-Bone *et al.*, 2012). In a cross-sectional study of some 4,700 Finns, high handgrip forces for 1 or more hours per day for at least 20 years, and handling loads of 20 or more kg for 10 or more times per day for 20 or more years, were all reported to more than double risks of medial epicondylitis (Shiri *et al.*, 2006). In a smaller study of 591 assembly workers from Thailand, medial (but not lateral) epicondylitis was associated with an awkward posture at the elbow while using the upper limb repetitively (Pullopdisakul *et al.*, 2013, OR 3.14). All of these findings were statistically significant ($P < 0.05$).
35. These examples illustrate a problem, however, in interpreting the research literature. Physical exposures have been characterised in many ways, according to their site of action (e.g. elbow, wrist), their frequency (e.g.

repetitions per hour or day), their direction (e.g. bending/straightening, rotation), their loading features and demands (e.g. high grip force, precision of grip), their duration (e.g. years within the job), and various combinations of factors. A comparison of these reports indicated that no two studies were sufficiently alike in their choice of exposure definition to be confident that they measured the same thing.

36. The totality of evidence suggests that workers who experience a high intensity and combination of ergonomic risk factors may be at substantially elevated risks of epicondylitis. However, the complexity of exposure definitions and their inconsistent use between studies has made it impossible, beyond conjecture, for the Council to define a suitable exposure schedule for prescription at the present time.

Combining job title and activity?

37. The Council has also given consideration to the possibility that evidence of risk by activity may be combined with that by job title. Unfortunately, assessments of ergonomic exposure were generally lacking in reports of risk by job title, precluding further progress through this approach.

Conclusions

38. Despite the passage of time and a growing body of evidence, IIAC is unable to recommend prescription for epicondylitis.
39. An encouraging amount of new data on this problem has been published since 2006, much of which suggests a potential hazard of occupation. The Council intends, therefore, to keep the topic under review. It is keen to receive new evidence in this area as it emerges.
40. Researchers have made great strides in harmonising case definitions for use in studies of epicondylitis over recent decades. They are encouraged now to adopt a more harmonised approach to the assessment of occupational exposures.

Prevention

41. Relevant work activities should be subject to suitable and sufficient assessment of the risk from upper limb disorders such as epicondylitis. The main risk factors are high repetition, awkward working postures, high force, prolonged duration of exposure and lack of time for recovery. The risk assessment should then identify control measures to eliminate or mitigate the risk. Where practicable, risk should be eliminated at source, i.e., does the task have to be performed in the way it is, or could it be automated?

42. The risk can be minimised by reducing exposure to the above risk factors. Changes to the task, the individual (or work group) and the working environment should be considered. Often a combination of changes to all three is the most effective strategy.
43. Changes to the task may include redesign of the workstation or the equipment used to perform the task. Job rotation between employees is often used to decrease an employee's exposure to a specific risk if that risk cannot be eliminated.
44. Changes to the individual (or work groups) may involve providing the correct training and information for them to perform their tasks. However, training should be used to complement other risk controls, and not as the only control.
45. Changes to the working environment may involve modifying workplace temperature and lighting levels as well as reviewing work organisation, working hours, scheduling of breaks, and working relations.
46. Employees carrying out the task have first-hand knowledge of the factors that cause or contribute to an issue, so they and their safety representatives should be involved in designing the risk control measures.
47. The prevalence of upper limb disorders can be identified by reviewing health, injury and sickness absence records, and reports by employees and their safety representatives.

Diversity and equality

48. IIAC seeks to promote equality and diversity as part of its values. The Council has resolved to seek to avoid unjustified discrimination on equality grounds, including age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, gender and sexual orientation. During the course of the review of epicondylitis no diversity and equality issues were apparent.

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Glossary

Types of study

Cross-sectional study: A study which classified people at a point in time as having a given disease (or characteristic) or not (controls), and then compares them in terms of exposure to one or more risk factors of interest. Is disease more frequent in those with exposure than in those without? The outcome can be expressed as an *Odds Ratio*, *Prevalence Ratio* or *Relative Risk*.

Cohort or longitudinal study: A study which follows those with an exposure of interest (usually over a period of years), and compares their incidence of disease or mortality with a second group, who are unexposed or exposed at a lower level. Is the incidence rate higher in the exposed workers than the unexposed/less exposed group? Sometimes the cohort is followed forwards in time ('prospective' cohort study), but sometimes the experience of the cohort is reconstructed from historic records ('retrospective' or 'historic' cohort study). The ratio of risk in the exposed relative to the unexposed can be expressed in various ways, such as a *Relative Risk* or *Incidence rate ratio*.

Measures of effect

Risk: The probability that an event will occur (e.g., that an individual will develop disease or die within a stated period of time or by a certain age).

Prevalence: The proportion of a defined group or population who share a characteristic (e.g. disease) in common at a specific point in time.

Incidence (rate): The rate of occurrence of new cases (e.g. of a disease of interest) over time in those who are initially unaffected but at risk of becoming a case.

Measures of association

Relative Risk (RR): A measure of the strength of association between exposure and disease. RR is the ratio of the risk of disease in one group to that in another. Often the first group is exposed and the second unexposed or less exposed. A value greater than 1.0 indicates a positive association between exposure and disease. (This may be causal or have other explanations, such as bias, chance or confounding.)

Odds Ratio (OR): A measure of the strength of association between exposure and disease. It is the odds of exposure in those with disease relative to the odds of exposure in those without disease, expressed as a ratio. For rare exposures, odds and risks are numerically very similar, so the OR can be thought of as a Relative Risk. A value greater than 1.0 indicates a positive association between exposure and disease. (This may be causal or have other explanations, such as bias, chance or confounding.)

Incidence Rate Ratio: The ratio of the incidence rate of disease in one group to that in another (e.g. in the exposed group vs. the unexposed). A value greater than 1.0 indicates a positive association between exposure and disease. (This may be causal or have other explanations, such as bias, chance or confounding.)

Prevalence Ratio: The ratio of the prevalence of disease in one group to that in another (e.g. in the exposed group vs. the unexposed). A value greater than 1.0 indicates a positive association between exposure and disease. (This may be causal or have other explanations, such as bias, chance or confounding.)

Statistical significance and P values: Statistical significance refers to the probability that a difference as large as that observed, or more extreme still, could have arisen simply by chance. The smaller the probability, the less likely it is that the difference can be explained by chance alone, rather than being a real difference. By convention, when this probability is less than 5% ($p < 0.05$) a difference is described as being “statistically significant” Significance tests are used to compare effects in one group with another (e.g. the exposed group vs. the unexposed). They only describe association. Statistically significant associations are not necessarily causal and can arise due to bias or confounding.

Other epidemiological terms used in this glossary

Confounding: Arises when the association between exposure and disease is explained in whole or part by a third factor (confounder), itself a cause of the disease that occurs to a different extent in the groups being compared.

Bias: A tendency to produce an estimate of effect that is systematically different from the truth (either too high or too low)

