Notes and miscellanea

Vibration syndrome

R. I. McCALLUM

Nuffield Department of Industrial Health, University of Newcastle upon Tyne

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In 1862 Maurice Raynaud wrote a thesis '*De l'asphyxie locale et la gangrène des extrémités*'. The severe condition he described affected the hands and feet of young women and may in some cases have been due to ergotism but he also drew attention to 'dead finger' as a recurrent and relatively trivial condition causing only slight inconvenience. The subsequent recognition of the association of intermittent attacks of cold-induced pallor or cyanosis of the extremities with a number of different conditions led to the general use of the term 'Raynaud's phenomenon'. It has been recognized for some time that similar changes which may affect the hands of workers using vibrating tools for a wide range of industrial tasks, such as riveting and drilling or jobs requiring pneumatic hammers or chisels, are distinguishable from Raynaud's phenomenon due to constitutional or other causes. The term 'Raynaud's phenomenon caused by the use of vibrating tools' has until now served to separate it from other forms of Raynaud's phenomenon having a different aetiology. The eponym and colloquial terms such as 'dead hand' or 'white fingers' have been rejected by the Industrial Injuries Advisory Council in their recently published Interim Report (1970) in favour of the descriptive term 'Vibration induced white fingers (VWF)', and they have named the whole complex of symptoms associated with vibrating tools 'vibration syndrome'. If these terms come into general use they should help to clarify the present rather confused situation.

Although pneumatic tools operated by means of a reciprocating piston which causes rapid vibration of the tool began to be used generally in about 1883, their association with symptoms in the hands was first reported in 1911 (Hunter, 1969). It is well established that a high proportion of users of vibrating tools suffer from VWF. For example, Agate

(1949) estimated that between 77% and 90% of 278 men who had used a rotary tool to polish metal castings suffered from VWF at the time of use or later. However, opinions differ radically on the importance of these changes in causing significant disability in even a minority of sufferers; on whether the muscle and joint symptoms which may accompany VWF are merely the result of heavy manual work or something more sinister; and on whether there is sufficient evidence of serious disability in some men to justify the award of disablement benefit.

In January 1967, the Minister of Social Security referred to the Industrial Injuries Advisory Council the question whether vibration syndrome should be prescribed under the National Insurance (Industrial Injuries) Act 1965. The Council has now decided by a majority of seven to two that the question cannot yet be resolved and that further enquiries are necessary on all its aspects.

It is interesting at this point to recall an earlier attempt of the Council to settle this problem. The question whether Raynaud's phenomenon should be prescribed under the 1946 National Insurance (Industrial Injuries) Act was first referred to the Industrial Injuries Advisory Council as long ago as March 1950. It was passed to their Industrial Disease Sub-committee, the report of whose five members was published in November 1954 (Industrial Injuries Advisory Council, 1954.) The Sub-committee concluded by a majority of four to one that prescription of Raynaud's phenomenon could not be recommended. Five of the 17 members of the Council associated themselves with the minority report in favour of prescription, but one member, the late Dr. L. G. Norman, could not support either the majority or the minority report without qualification and recommended that Ray-

naud's phenomenon caused by the use of vibratory tools should be a prescribed disease but that disablement benefit should not be awarded unless the loss of faculty exceeded 10%.

The Industrial Injuries Act of 1946 provided for benefit for certain prescribed conditions due to the nature of the employment. These conditions had to be an occupational risk and not one common to everyone, and had to be attributable with reasonable certainty to the nature of the employment. The Report recalled that a Court of Appeal Decision in 1946 had given an award under the Workmen's Compensation Acts on the basis that the vibration of the tool caused the man injury from the cumulative effect of a series of minute blows each of which could be regarded as a separate accident. However, a tribunal consisting of the Industrial Injuries Commissioner and two Deputy Commissioners had decided that this decision could not be regarded as authoritative on the grounds that the injury was not due to a series of accidents but to a continuous process.

The matter was referred to the Medical Research Council's Occupational Health Committee who arranged for a survey to be carried out by the Universities of Manchester and Birmingham. The survey confirmed that there were a certain number of clearly occupational cases of Raynaud's phenomenon caused by the use of vibrating hand and machine tools and which involved a definite although relatively minor degree of disablement. Nevertheless difficulty was found in distinguishing between occupational and non-occupational cases because of the frequency of constitutional Raynaud's phenomenon. The Council thought that because of possible confusion with cases of constitutional origin it would be necessary to have 'a thorough examination by a doctor with special knowledge of vascular disease in general and Raynaud's phenomenon in particular'. They went on to add, 'such specialists are few in number'.

Difficulties were also anticipated in defining the limits of the occupational cover without considerable further investigations, in making the diagnosis on the claimant's own statement in the absence of objective signs, and in assessing the disability. Although it was pointed out that the vibration-induced condition differed from the constitutional form in that it tends to be limited to or affect more severely the fingers most exposed to the vibration, cover would have to be limited to occupations definitely known to cause the disease. While the great majority of patients with Raynaud's phenomenon were not incapacitated by it at all, in those with disability the usual assessment would be likely to be 3%, compared with 7% for loss of a ring finger. In the minority report, Mr. C. R. Dale pointed out that on balance of probability cases of Raynaud's

phenomenon could be said to be occupational or non-occupational, and that the majority report did not seem to disagree with this; that too much had been made of the difficulty of finding suitable specialists to diagnose it, and that diagnosis of a number of prescribed diseases may have to be made on the claimant's own account of his symptoms. He qualified this by admitting that prescription should be restricted to patients who could provide objective signs of the disease. Mr. Dale claimed that substantial disablement did occur in a small number of cases.

In the same year attention was drawn to the full syndrome by Reynard (1954) who described a number of symptoms additional to the white fingers. These symptoms included loss of sensation in fingers affected by vibration, aches in the muscles of the forearms and biceps and in the upper limb joints; weakness of the grip in the left hand with loss of power in the intrinsic muscles, and swelling of subcutaneous tissues around the proximal interphalangeal joints of the second and third fingers of the right hand. A detailed neurological study (Marshall, Poole, and Reynard, 1954) suggested that in a number of men using vibrating tools there was persistent nerve damage characterized by motor weakness and sensory loss. Premature numbness was provoked in these men by nerve ischaemia experimentally induced by sphygmomanometer cuffs, and in four subjects by means of a nerve clamp which produced ischaemia in a segment of a nerve in the upper arm. These authors were convinced that VWF could be accompanied by permanent damage to peripheral nerves and they further suggested that peripheral nerve damage might be the cause of vasospasm leading to the attack of VWF.

In another survey carried out recently at the request of the Industrial Injuries Advisory Council these conclusions were attacked by Stewart and Goda (1970) who suspected that the findings of Marshall *et al.* (1954) might be due to a special type of muscle fatigue detectable very soon after using the vibrating tool. They put forward the hypothesis that VWF was caused by deposition of callus on the finger pads from the use of fast moving tools. They suggested that the callus formation results in a fall in the volume of blood which can be held in the capillaries of a segment of the finger, and allows temperature-induced changes in blood volume to become visible. Their theory assumes that vasospasm is an essential part of the process rather than vibration-induced damage to nerve endings. They also studied the other symptoms associated with vibrating tools such as aching in the arms and hands which Reynard (1954) included as part of the syndrome. They doubted whether these were more frequent than in other manual workers, but without including any observations on men in such work.

Stewart and Goda (1970) made the point that in the factory in which Marshall and his colleagues (1954) carried out their investigation 46 of the 50 men who were investigated in 1954 were still employed full time and were in excellent physical condition. Thus they were unable to accept that men with these symptoms were suffering from 'an obscure neuropathy' although their complaints were related to their occupations.

In the present Report (Industrial Injuries Advisory Council, 1970) the Council refer back to the grounds on which it rejected prescription of VWF in their majority report of 1954, and discuss their views on them now. While they consider that occupational VWF can be distinguished from Raynaud's phenomenon, they accept the view that the aches and pains in the upper limbs and joints are not distinguishable from those due to normal muscular effort at work. The problem of occupational cover could, in their opinion, be overcome by reference to the speed of vibration of the hand tool or machine. As far as VWF is concerned, the claimant's symptoms rather than an objective test would still have to be evaluated but the requirement of a minimum period of exposure to a particular speed of vibration would help. Again the aches and pains are not included here because they are not disabling. On the evidence of the survey carried out by Stewart and Goda (1970) the Council do not consider the VWF significantly disabling, as it is reversible in some cases and it affects mainly outdoor hobbies. With regard to the callus theory of causation, the Council is cautious and considers that it awaits clinical confirmation.

The amount of disability from VWF is seen by the Council to be central to their investigation but they concede that there is much difference of opinion on this point. They have not been able to accept the evidence of individual cases which they were given because of the suggestion in the case histories of the possibility of generalized arterial disease which might have caused the symptoms. Disability from vibration syndrome sufficient to cause change of employment is still a matter which the Council is studying, as is the possibility of bone damage. Messrs. Dale and Martin, in their short minority report, believe that VWF satisfies the conditions for prescription but agree that the other features of the whole syndrome require further research.

In spite of the detailed consideration given since 1950 by the Industrial Injuries Advisory Council to all the evidence, including the two specially commissioned surveys, there has been disappointingly little progress in reaching satisfactory decisions on vibration syndrome. The objections raised in the minority reports of 1954 and 1970 have still not been convincingly answered. Would prescription in fact present such great difficulties and would they be any

greater than those which attend some of the prescribed diseases on the present list? The Council emphasize the triviality of disablement in the majority of patients with VWF but this is increasingly the case in other diseases, such as lead poisoning, for example, because control of the hazard has become more efficient and methods of detection are more refined.

It is to be hoped that in the Council's final report there will be an analysis of the practice in other industrial countries as regards definition and assessment for compensation of vibration syndrome. In spite of the different social backgrounds there must be much to be learnt from their experience.

The callus theory of Stewart and Goda (1970) is a completely new approach to the aetiology of VWF but it is difficult to accept on the present evidence. Finger-pad callosities presumably occur in many other manual occupations and observations are required on the prevalence of white fingers in these jobs. Similarly, symptoms in the arms and shoulders of users of vibratory tools should not be assumed to be identical with those in men doing other heavy work not involving such tools without further investigation using controls.

Interest in the study of vibration syndrome seems at times to have been constrained by the feeling that its strikingly visible effects can easily be exaggerated in importance. Men have in the past tolerated disabilities which are minor as far as their work is concerned but which may limit their social life in some way. Boilermakers, for example, have traditionally tended to accept severe occupational deafness without protest. Men with VWF have been described as contented and in many cases to be doing work with vibrating tools from their own choice (Agate *et al.*, 1946). Now that there is increasingly more time and opportunity for leisure activities for the great majority of people, noise-induced deafness or VWF have to be considered more seriously than in the past in relation to the quality of life outside working hours and to their effect on hobbies or other recreation.

Whether or not prescription is eventually conceded there is still, therefore, an urgent need to find some means of preventing or at least reducing these undesirable side effects of common industrial tasks. It has been claimed that avoidance of certain frequencies of vibration by tool design would substantially reduce the prevalence of VWF (Hunter, McLaughlin, and Perry, 1945). There is, however, considerable variability in the frequency of vibration in using these tools (Agate *et al.*, 1946) and many other factors such as whether the tool is held in the hand and applied to the job or the job held in the hand and applied to the tool, personal susceptibility and skill, and the hardness of the metal being worked (Reynard, 1954) complicate the problem.

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International classification of radiographs of pneumoconioses

P. C. ELMES

Department of Therapeutics and Pharmacology, Queen's University of Belfast

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This simple little booklet is essential not only for the writers but the readers of journals describing radiological appearances in occupational lung disease. Those who actually have to read and classify the radiographs will need the standard set of films which go with it but they cost U.S. \$30.00.

The first classification was issued by the International Labour Office in 1950 and was revised and re-issued in 1958. However, the early versions were designed to deal with the changes produced by coal and silica dusts. As these pneumoconioses came under control, so the importance of others increased and the classification required modification to increase its usefulness and to meet users' complaints. The current classification is at two levels, a short relatively simple one for use in the assessment of individual cases and an extension of this for use in more detailed comparative surveys. The two classifications are entirely compatible and the extended form can be applied to all aspects of the radiographic changes or simply to those aspects which are appropriate to the study for which it is used.

The layout and description of the new short classification are reproduced from the booklet (Table 2). Compared with the 1958 classification it will be noted that the category Z is retained for those films which show some small opacities but they are insufficient in number or distribution to be attributed with certainty to inhaled dust. This category is not included in the extended classification where the changes from none to severe are regarded as a continuum. The size classification of the small opacities has had q and r inserted as alternative symbols to m and n to make phonetic distinction easier. The rib space quantification of small opacities has been omitted. More 'additional symbols' have been added to the classification. Those listed under 'obligatory' refer to findings which may be considered particularly relevant to or associated with the pneumoconioses. The 'optional symbols' are less relevant or less easily defined. In either case the meaning of the symbol must be explained by a comment in the report.

In the extended classification (Table 3) opacities