COMMENT

Sympathetic overactivity in ischaemic heart disease

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ABSTRACT

The efficacy of pharmacological β-blockade in decreasing cardiac death in patients after myocardial infarction suggests the existence of sympathetic overactivity and indicates the importance of assessing its magnitude. The paper by Graham and co-workers in this issue of Clinical Science has attempted to address this issue by measuring muscle sympathetic nerve activity (MSNA) in various groups of patients and control subjects. It was found that, after myocardial infarction, there was sympathetic overactivity, which was more marked and more long-lasting than after unstable angina, whereas, in the presence of simple coronary artery disease, sympathetic activity did not differ from that in control subjects. Clear signs of sympathetic overactivity lasting for months after an acute myocardial infarction have already been reported using quite different methodology, i.e. spectral analysis of heart period and systolic arterial pressure variability. The soundest hypothesis to explain such a sympathetic overactivity appears to be based on the well-demonstrated finding that the ischaemic heart is a powerful site of origin of both excitatory and/or inhibitory reflexes, which may be of paramount clinical importance.

In the prevention of sudden cardiac death, most often related to ischaemic heart disease, it is increasingly recognized that understanding the abnormal neural mechanisms may be of paramount importance [1]. On the other hand, the demonstrated efficacy of pharmacological β-blockade in decreasing cardiac death in patients after myocardial infarction suggests the existence of some degree of sympathetic overactivity to be blunted [2].

In this framework, the paper by Graham and co-workers [3] in this issue of Clinical Science is of interest and deserves a careful consideration. These authors [3] have evaluated sympathetic activity by recording multi-unit and single unit discharge in muscle sympathetic nerves (MSNA) in matched groups of patients with unstable angina (UA), acute myocardial infarction (AMI), stable coronary artery disease (CAD), chest pain without myocardial infarction (NMI), and in normal controls (NC). Measurements were obtained 2–3 days after UA or AMI and repeated at 3-monthly intervals until recorded sympathetic activity returned to normal levels. Both UA and AMI patients displayed, in respect to other groups, a sympathetic hyperactivity which, after AMI, was more marked and more protracted (9 month compared with 6 months) than after UA.

The same authors have already reported previously [4] the existence of a long-lasting sympathetic overactivity in patients after AMI, but no comparison was attempted with other cardiovascular dysfunctions also likely to be accompanied by abnormal neural mechanisms.

Some further comments may be appropriate. First of all, it should be pointed out that MSNA, in spite of its intrinsic appeal, is restricted to a sympathetic outflow directed to the periphery. The great selectivity of sympathetic reflex activity has been known for several decades through direct experimental approaches [5] that made clear the danger of identifying in one single pattern a reflex sympathetic excitation.

This limitation of MSNA can be overcome by associating it with other procedures, totally non-invasive, and by now validated by hundreds of studies, such as the spectral analysis of heart period and systolic arterial pressure variability [6]. With proper methodology, heart

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rate variability (HRV) has proven to furnish indexes of sympathetic (low frequency) and vagal (high frequency) modulations and, for the first time, of sympathovagal balance [7]. Similarly, the low-frequency component of systolic arterial pressure has been proposed [5–7] and is now widely accepted as an index of sympathetic vascular modulation. The simultaneous use of this approach would have furnished additional and quite interesting data. It was, indeed, with this methodology that a protracted sympathetic overactivity was demonstrated for the first time in patients after AMI [8].

As to the cause of this sympathetic overactivity, Graham et al. [3] consider a number of mechanisms most of which appear unlikely to be the promoters, as in the case of baroreflex dysfunction. Conversely, the soundest hypothesis among those mentioned appears to be that based on mechanisms which have been extensively and fully demonstrated in experimental conditions. In short, both excitatory [9] and inhibitory [10] reflexes have been found to arise from the ischaemic heart. Indeed, it is quite likely that both sets of reflexes are usually activated simultaneously [11], although one of them usually prevails. It is sympathetic overactivity that decreases the baroreflex function, as experimental evidence has proven [12], and common sense suggests in the frame of natural behaviours. The \textit{a priori} opposite hypothesis is a classical Ptolemaic error [13].

REFERENCES


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