Special supplement

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7. Recommendations on stress management

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Abstract

Objective: To provide updated, evidence-based recommendations for health care professionals concerning the effects of stress management on the prevention and control of hypertension in otherwise healthy adults (except pregnant women).

Options: Alternatives to stress management include other nonpharmacologic interventions and medical therapy; these options are not mutually exclusive.

Outcomes: The health outcome considered was reduction of blood pressure. There is little evidence to date that stress management prevents death or vascular events. Because of insufficient evidence, no economic outcomes were considered.

Evidence: A systematic search of the literature (which yielded, among other sources, 3 meta-analyses) was conducted for the period 1966–1997 with the terms essential hypertension, treatment, psychological, behavioural, cognitive, relaxation, meditation, biofeedback and stress management. Other relevant evidence was obtained from the reference lists of the articles identified, from the personal files of the authors and through contacts with experts. The articles were reviewed, classified according to study design and graded according to level of evidence.

Values: A high value was placed on the avoidance of cardiovascular morbidity and premature death caused by uncontrolled hypertension.

Benefits, harms and costs: The magnitude of the reduction in blood pressure obtained with multicomponent, individualized cognitive behavioural intervention for stress management was comparable in some studies to that obtained with weight loss or drugs; single-component interventions such as biofeedback or relaxation were less effective. The adverse effects of stress-management techniques are minimal, but the cost for effective interventions is substantial, similar initially to drug costs; continuing costs are probably minimal.

Recommendations: (1) In patients with hypertension, the contribution of stress should be considered. (2) For hypertensive patients in whom stress appears to be an important issue, stress management should be considered as an intervention. Individualized cognitive behavioural interventions are more likely to be effective than single-component interventions.

Validation: These recommendations were reviewed by all of the sponsoring organizations and by participants in a satellite symposium of the fourth International Conference on Preventive Cardiology. They have not been clinically tested.

Sponsors: The Canadian Hypertension Society, the Canadian Coalition for High Blood Pressure Prevention and Control, the Laboratory Centre for Disease Control at Health Canada, and the Heart and Stroke Foundation of Canada.

The association between psychosocial stress and atherosclerotic events, such as myocardial infarction, has received considerable attention over the past 2 decades.[1–4] The only study to evaluate the relation between stress and stroke found a significantly higher incidence of stroke among men reporting a higher level of stress.[5] Significant correlations have also been found between clinical symptoms of coronary artery disease and the type A behaviour pattern,[6] as well as high levels of life stress[7] and job strain.[8] In addition, associations have been observed between type A behaviour and coronary artery atherosclerosis, as assessed by angiography.[7–10] Finally, one study found an association between type A behaviour and carotid artery atherosclerosis, as measured by ultrasonography.[11]

These findings suggest a link between psychosocial factors and atherosclerosis; however, the specific nature of the association is not known. One hypothesis is that cardiovascular reactivity, or the response of the cardiovascular system to stress, may mediate this relation. For example, Manuck and Krantz[12] hypothesized that repeated physiologic arousal involving acute changes in hemodynamic and cardiac functioning in response to psychological challenge could trigger atherogenic processes. Hemodynamic forces, such as turbulence and shear stress

(which may be highly influenced by cardiovascular reactivity), may cause or exacerbate existing endothelial damage and promote the development of atherosclerotic lesions.[13] Some support for this hypothesis has been obtained in vivo. Monkeys that exhibited high cardiovascular reactivity to stress (threat with a capture glove) had twice as much coronary atherosclerosis as monkeys with low reactivity to stress.[14]

Recently, it has been shown that the rise in blood pressure during mental stress induced by a frustrating cognitive task is a stronger predictor of progression of carotid atherosclerosis than any of the Framingham risk factors.[15]

The previous Canadian consensus conference on stress management and hypertension[16] found little evidence that interventions designed to reduce the effect of stress on blood pressure were effective and insufficient evidence to recommend stress management as an intervention for hypertensive patients. Since the publication of that report, there has been considerable progress in this area.

Methods

A complete description of the methods used in developing these guidelines is given in part 1 of this supplement.[17]

The chair and members of the panel were selected by the Organizing Committee for the lifestyle modification recommendations to obtain a spectrum of health care professionals and scientists with expertise and interest in the areas of psychology, nursing and medicine.

MEDLINE and Psychinfo searches were conducted for the period 1966–1997 with the search terms essential hypertension, treatment, psychological, behavioural, cognitive, relaxation, meditation, biofeedback and stress management. Additional articles were identified by reviewing the reference lists of the identified articles, were found in the personal files of the panel members and were suggested by other experts. Trials, reviews and meta-analyses were considered. The principles for grading the evidence and the recommendations were based on those previously used by the Canadian Hypertension Society[18] and are summarized in part 1 of this supplement.[17] An attempt was made to reach consensus on all recommendations. The evidence and recommendations were presented to the other expert panels for this guidelines series, submitted for review to major Canadian organizations and presented at an international conference on preventive cardiology, to allow for further national and international input. All revisions were reviewed and assessed by the panel before incorporation into the final document.

Results

Strategies used in individualized cognitive behavioural stress therapy include increasing awareness of stressors and stress responses, re-evaluating negative life events, communications skills training (e.g., marital communication and assertiveness training), development of problem-solving skills, management of negative emotions (e.g., anger and anxiety) and techniques for decreasing sympathetic arousal (e.g., relaxation exercises).

There is no evidence that stress management *prevents* hypertension, but there is some evidence that stress management can reduce blood pressure in hypertensive patients. Although the evidence indicated that single-component interventions such as transcendental meditation and relaxation therapy could be efficacious in some centres, meta-analysis showed only small effects or no reduction in blood pressure. In one meta-analysis[19] the change in blood pressure with such interventions was –1.5 to +2.9/–0.8 to +1.2 mm Hg, whereas the change was –9/–6 mm Hg in a second meta-analysis.[20]

A third meta-analysis[21] showed a similar pattern, although the differences between individualized cognitive stress management and other paired or single-component interventions was not as marked (Table 1).

In contrast, multicomponent individualized cognitive behavioural interventions reduce blood pressure to a greater degree and over a longer period of time. Linden and Chambers[20] performed a meta-analysis and found that blood pressure was reduced by 9.7/7.2 mm Hg with multicomponent relaxation techniques. With individualized cognitive stress management, blood pressure was reduced on average by 15.2/9.2 mm Hg. The key to this approach is tailoring the intervention to the patient's needs.

Table 1 presents the results of overviews and meta-analyses.[19–21] There was some overlap (approximately two-thirds) in the studies that were included in the meta-analyses, as determined from an examination of the bibliographies of the original papers. Table 2 presents the results of the 6 randomized controlled trials among the 9 studies[22–30] we found that were not included in the meta-analyses. There was no grade I evidence of effects on morbidity or mortality rates. The study of Alexander and associates[23] came closest to providing such evidence, since it compared mortality rates in a treatment group and a control group. They reported that 73 volunteers in a program in which they were randomly assigned to participate in transcendental meditation, a "mindfulness" intervention or a control intervention had significantly higher 3-year survival than did 478 nonparticipants. However, there is a significant risk of confounding when people volunteer for such a trial, and nonparticipants cannot legitimately be compared with volunteers. Survival was 77% in the control group, 87.5% among those who participated in the mindfulness intervention and 100% among those who did transcendental meditation. These differences were not statistically significant.

One small study[29] showed a significant reduction in requirement for antihypertensive medication with a multicomponent cognitive behavioural intervention. After 12 months blood pressure was controlled without medication in 55% of the treatment group but only 30% of the control patients.

Recommendations

- In patients with hypertension, the contribution of stress should be considered (grade D recommendation).

- For hypertensive patients in whom stress appears to be an important issue, stress management should be considered as an intervention. Individualized cognitive behavioural interventions are more likely to be effective than single-component interventions (grade B recommendation).

Interpretation

Knowledge about the effectiveness of stress management is the area that has probably changed the most since the previous guidelines were published. The previous consensus conference was not able to make any recommendations regarding stress management, because evidence to support such recommendations was lacking at that time.[16] There is now sufficient evidence to say that individualized cognitive behavioural stress therapy reduces blood pressure for up to a year. However, at best grade B recommendations can be made because there is as yet no evidence that such therapy reduces important endpoints such as death rate and incidence of myocardial infarction or stroke.

Research in this area has been hampered by methodologic problems. In comparison with the sophisticated dou-

Table 1: Reviews and meta-analyses of studies of stress management and hypertension

No. of studies	Subjects	Intervention	Baseline BP, mm Hg	Change in BP, mm Hg	
				Systolic	Diastolic
26 RCTs[19]	1264 patients: 723 in therapy, 541 controls	Biofeedback	NA	+2.9	+1.2
		Meditation	NA	+0.4	+1.1
		Relaxation	NA	–1.5	–0.8
		Combination	NA	–13.5	–3.4
53[20]	812	Single relaxation	145/94	–9.0	–6.1
25[20]	519	Multicomponent relaxation	145/95	–9.7	–7.2
12[20]	320	Individual cognitive therapy	147/93	–15.2	–9.2
Multiple regression[21]		Plain relaxation	NA	+3.5	0
		Stress management	NA	–5.7	–3.1
		Relaxation + EMG biofeedback	NA	–3.2	–2.5
		Mixed relaxation	NA	–1.2	–2.6
		Relaxation + temp biofeedback	NA	–0.6	–3.0
		Meditation	NA	+1.3	+2.3
		Relaxation + BP biofeedback	NA	+3.6	+1.3

Note: BP = blood pressure, RCT = randomized controlled trial, NA = not available, EMG = electromyographic, temp = temperature.

Table 2: Individual studies not included in the reviews

Study design	Subjects	Baseline BP, mm Hg	Intervention	Results*
RCT[28]	NA	NA	Large stress-management groups†	No effect (ineffective intervention) on SBP
RCT[30]	28 in trial of individual psychotherapy	ABP	Treatment Wait-list control Delayed therapy	SBP –8; DBP –5.4 SBP +5.3; DBP +3.4 SBP –14.5; DBP –10
RCT[25]	127 black-Americans, 55–85 yr	SBP ≤ 189; DBP 90–109	Transcendental meditation Progressive muscle relaxation Education control program	SBP –10.4 (1.6)‡; DBP –5.7 (1.2) SBP –4 (1.9); DBP –2.1 (0.9) SBP –1.5 (2.7); DBP – 0.6 (1.4)
RCT[22]	53 lonely women: 35 therapy, 18 control		Peer support No support	SBP –8.9; DBP –3.6 SBP –0.6; DBP –1.4
RCT[23]	73 volunteers, 478 non-participants all elderly (age 81or older) nursing home residents		Transcendental meditation Mindfulness Control Non-participants	3-yr survival 100%, NS 3-yr survival 87.5%, NS 3-yr survival 77%, NS 3-yr survival 62.5%, $p < 0.001$§
RCT[29]	39 patients	DBP > 95 with drug therapy	Multicomponent cognitive behavioural intervention	Reduced medication in treatment v. control group; at 12 mo, 55% of treatment and 30% of control group medication-free

Note: ABP = ambulatory blood pressure, SBP = systolic blood pressure, DBP = diastolic blood pressure, NS = nonsignificant.
*Changes in blood pressure in millimetres of mercury.
†Patients in the stress-management groups experienced more stress and worse well-being.
‡Mean (and standard deviation).
§Nonparticipants were not comparable to volunteers.

ble-blind randomized controlled trials for new medical treatments to reduce blood pressure, the quality of evidence on stress and hypertension is in many cases of a lower order. Some studies are not randomized, and it is virtually impossible to achieve a "double-blind" control in studies in which interventions are cognitive. The panel had difficulty finding convincing evidence. In addition, it appears likely that some patients respond to stress management, whereas others do not; therefore, a key issue is identification of those patients who are more likely to respond.

Future research

The strength of the recommendations that can be made at this time is limited by several methodologic issues. This area of research would be improved by attention to the following issues.

Studies should incorporate sufficient pre-intervention visits with the patient (a minimum of 3) to accurately determine baseline blood pressure levels. The role of 24-hour ambulatory monitoring needs further exploration with respect to prediction of cardiovascular events.

Follow-up to assess the efficacy of the intervention should last for at least a year, and even longer follow-up is desirable.

During the course of a stress-management intervention study, the patient should be receiving no drug therapy, or the drug therapy should not change. If drug therapy is to be changed during the course of a study, it is necessary to specify strict protocols for such changes.

Cognitive interventions should be described in sufficient detail to permit replication.

Control groups should receive credible sham interventions.

Baseline characteristics should be carefully described. Additional research is needed to identify which subjects are more likely to respond to stress management. The characteristics of "responders" probably include perceived level of stress, life events, emotional arousability, psychophysiologic reactivity, family history, white coat phenomenon, expectations and motivation.

Studies are needed to determine the relation between provocation of blood pressure increases during stressful laboratory tasks, ambulatory blood pressure recordings and life events (which would be an indication of the "ecological" validity or generalizability of the study to the "real world").

Hardware and software are needed for measuring blood pressure and heart rate from one beat to the next and providing power spectral analysis of heart rate variability to determine the contribution of sympathetic and parasympathetic activity.

Studies of women and various racial and ethnic groups are needed.

Long-term studies of clinically important outcomes such as death and myocardial infarction are ultimately required to show the effectiveness of stress management interventions.

Conclusions

Individualized multicomponent cognitive behavioural interventions are effective in reducing blood pressure; single-component interventions such as biofeedback, relaxation therapy and transcendental meditation are less likely to be effective.

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