Device-assisted Slow Breathing as a Complementary Treatment for Hypertension

By Robert P. Nolan

Guidelines for primary and secondary prevention of cardiovascular disease in Europe and North America suggest that behavioral interventions (relaxation training, stress management, biofeedback or meditation) may assist the treatment of patients for whom psychosocial stress is of clinical concern. Several reviews have evaluated whether these behavioral interventions can be utilized to improve the regulation of blood pressure (BP) among patients with hypertension. With the exception of smoking cessation, exercise training and diet modification, no behavioral treatment has been established as conferring independent benefit on long-term clinical outcomes, including BP reduction.

Over the past 15 years there has been considerable research regarding a potential antihypertensive effect of slow, deep breathing, which is a common feature of behavioral training in stress-reduction techniques. Paced breathing, between six and 10 breaths per minute, has been reported to evoke short-term reductions in systolic and diastolic BP among patients with hypertension, cardiovascular disease and chronic heart failure.

It is hypothesized that slow, deep breathing as a complementary antihypertensive treatment augments vagal-efferent modulation of heart rate, while increasing cardiovagal baroreflex control over BP and sympathetic outflow to peripheral sites, which decreases peripheral resistance. However, a specific depressor mechanism that is linked to treatment with slow, deep breathing has not been clearly demonstrated.

Device-assisted training in slow breathing with the RESPeRATE apparatus has been reported to reduce BP of hypertensive subjects with or without antihypertensive medication, following eight weeks of treatment that included 10 to 15 minutes of practice per day. The RESPeRATE intervention consists of a thoracic belt that monitors chest movement associated with respiration. This signal is analyzed by a control unit that plays back (in real time, via headphones) synthesized musical tones for inspiration and expiration matching the patient’s breathing pattern. The control unit gradually prolongs the expiration phase of breathing and the patient is directed to follow the modified sound pattern within their comfort range until a steady state is obtained, which is targeted below 10 breaths per minute.

The RESPeRATE website (www.resperate.com) states that systolic and diastolic BP of hypertensive patients is reduced on average by 14 mmHg to 8 mmHg. This estimate is based on seven studies, all with positive findings, derived from a pooled sample of 256 patients. The website promotes it as a safe treatment for patients with diabetes and kidney failure. An editorial review by Parati and Carretta in the Journal of Hypertension in 2007 summarized the available evidence on RESPeRATE as consisting of one review paper with a case study, two small sample observational studies with a pre- and post-treatment comparison, two prospective investigations that utilized a case-control design, and two randomized controlled trials. One of the latter two randomized trials directed an “active” control group to listen to synthesized tones (similar to RESPeRATE) for a 10-minute interval each day on portable audio players. This procedure may have been viewed with some skepticism, as evidenced by the 12% dropout rate in this study that arose solely from control subjects. The other randomized trial used a control condition in which patients simply monitored their BP.

There has not been a lot of critical discussion in the available literature about the RESPeRATE treatment, perhaps because almost all of the small number of published reports were at least partially affiliated with the manufacturer. However this situation changed in 2007 with the publication of a clinical trial by Logtenberg et al in the Journal of Hypertension that prompted the above-noted editorial review (Parati and Carretta 2007). This randomized controlled trial used a control condition in which patients simply monitored their BP.
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BP-reduction, which was slightly greater with ARBs than with CCBs. As expected from the mechanism of action, the ACE inhibitors and ARBs significantly reduced proteinuria by 49% and 59%, respectively.

Conclusions
Our clinical knowledge is limited by the rarity of hypertension in children, making it difficult to observe meaningful clinical trial endpoints and dose-response effects, and the paucity of large trials using superior design strategies. Future studies should link the effect of antihypertensive drugs to organ damage and ultimate patient outcomes. Meanwhile, clinicians caring for children are forced to extrapolate from the large body of evidence among adult subjects, which suggests that reduction in BP is associated with improved overall cardiovascular health and survival.

Further Reading:

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trolled trial enrolled patients with hypertension and a diagnosis (> 2 years) of type 2 diabetes. All were receiving antihypertensive medications, which were not altered. RESPeRATE was compared to an active control group that listened to diverse types of music under the auspices of “music therapy.” Outcome following eight weeks of treatment was evaluated using an intention-to-treat analysis. Of note, systolic/diastolic BP at post-treatment was reduced in the RESPeRATE group (-7.5 mmHg/-1.0 mmHg) and controls (-12.2 mmHg/ -5.5 mmHg). The magnitude of BP reduction did not differ between these two groups.

The report of a null finding for the RESPeRATE device helped to promote a constructive debate in a subsequent exchange of letters about strengths and limitations of this proposed antihypertensive treatment. At least two major shortcomings are evident in previous research with RESPeRATE:

1. The absence of an appropriate intention-to-treat analysis, where the BP measures of dropouts should have been incorporated into the outcome data; and
2. Use of an “active” control procedure that is appropriately matched to RESPeRATE and which is plausible to subjects as a behavioral antihypertensive procedure.

Certainly, it is important to resolve these issues before RESPeRATE can be viewed as an independent, complementary treatment for hypertension.

In summary, slow and paced breathing may prove to be a critical component of behavioral interventions (e.g., relaxation training, meditation and biofeedback) that evoke short-term reductions in BP. Training with the RESPeRATE device offers a novel approach within this class of behavioral procedures. However, it is difficult to view the available evidence concerning RESPeRATE as having evolved beyond an experimental stage of development. More compelling evidence seems warranted before it can be widely recommended to patients as a complementary treatment that offers additional, independent benefit for BP reduction.

Further Reading:

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