CLINICAL VIGNETTE

Bach's Well-Tempered Prescription for Hypertension

Ramin Tabibiazar, MD, Arnav Dave, and Eve M. Glazier, MD

Case Presentation

A 48-year-old male, professional musician presented to Cardiology with new onset stage 1 hypertension. He had no additional co-morbidities, exercised regularly and followed a healthy diet. He was a non-smoker, had limited alcohol and caffeine intake, and no history of substance abuse. There was no family history of hypertension or cardiac disease. On physical exam, he appeared anxious but had no signs of end organ hypertensive disease. On two separate visits, his blood pressure measurements were recorded in the 130s/85-90 range, with a pulse in the 90s bpm. His electrocardiogram was normal, and his electrolytes, renal function and thyroid screening tests were unremarkable.

The treatment plan recommended lifestyle modifications and monitoring home blood pressure recordings. On the first follow-up visit, a discrepancy between his home and office blood pressure readings was noted. Home readings were generally in the normal range, and rarely elevated. However, his office readings were consistently elevated. The patient requested additional monitoring without anti-hypertensive medications. He was educated about hypertension and potential long-term effects of poorly controlled hypertension. It was suggested that anxiety may contribute to the discrepant readings. On a subsequent visit, the patient had normal blood pressure readings and appeared relaxed and cheerful. He arrived early for his appointment, and spent 30 minutes relaxing, while listening to a harpist in the lobby of the medical center. He was given positive feedback about his blood pressure, and implemented a routine of regularly listening to a short harp solo, prior to measuring his BP at home and the clinic. The patient continues to follow-up, and remains normotensive without pharmacotherapy.

Discussion

Systemic hypertension is a leading cause of cardiovascular morbidity and mortality and is the strongest modifiable risk factor. In recent years, the prevalence of hypertension has increased with reduced rates of blood pressure control.[1,2] Despite interventions, cardiovascular morbidity and mortality associated with hypertension continue to increase globally. In addition, treatment costs, adverse effects, and drug resistance have led to increasing interest in non-pharmacological methods to lower blood pressure. Recent guidelines have proposed that in patients with elevated blood pressure and stage 1 hypertension, lifestyle modifications may prevent or delay onset of high blood pressure and lower cardiovascular morbidity and mortality. Patients are often interested in starting with non-pharmacologic therapy, which may suffice to control blood pressure.

The newer hypertension control guidelines have focused on lifestyle modifications as the initial step. There are significant benefits in involving and empowering patients in their plan of care. When successful, not only does this approach provide positive feedback, but it also improves compliance and enhances the effects of treatment. Several lifestyle modifications have been studied and found effective in lowering blood pressure. These interventions include weight loss, regular exercise regimen, healthy low-sodium diet, limiting alcohol consumption, smoking cessation, reducing caffeine intake, and lowering stress.[3,4]

Music therapy is an emerging tool in treating several conditions. Music has been shown to lower heart rate and blood pressure, though its effects are more significant in lowering systolic blood pressure.[5,6] In addition, studies have demonstrated its effectiveness in reducing pre-operative pain, anxiety and depression, as well as improving some aspects of dementia, autism spectrum disorder, and movement disorders.[7-10] A small study, reported lower anxiety levels in pre-operative patients who listened to harp music.[11]

Music evokes emotions by causing structural and functional changes to the cortex and limbic system, as well as the neuroendocrine and the autonomic nervous systems. After entering the ear canal, and the eardrum, the sound wave vibrations are converted to electrical signals which are propagated to the brainstem, which is the brain's relay station for all types of sound. Based on the type of sound or music and the listeners' musical expertise (novice, performer, composer), the signals are then sent to different areas in the brain. Music can simultaneously activate several parts of the brain. When hearing a familiar tune, multiple areas of the brain are activated. In such instance, the temporal lobe identifies the tone and pitch of the piece, the cerebellum processes the cadence and rhythm, while the amygdala and hippocampus bring back any memories associated with the song.

Music therapy can lower blood pressure by several proposed mechanisms. By activating the limbic system and releasing endorphins, music can induce a more relaxed and less anxious

state.[12] The baroreflex sensitivity is lowered by slowing down breathing frequency, which increases parasympathetic tone and decreases sympathetic tone. This alteration in the autonomic nervous system results in lowering blood pressure and heart rate. Imaging Functional PET has also shown that music releases dopamine in the dorsal and ventral striatum resulting in lowering blood pressure.[13] This occurs via a calmodulin-dependent mechanism that inhibits sympathetic activity via dopamine-2 receptors.

Beethoven or Bach?

In a study performed on normotensive, non-medicated individuals who listened to music by Beethoven or Bach, Bach's music was more effective in lowering listener's blood pressure.[14] This effect is explained by the differences in tempi, sound volumes, and musical dynamics that differentiate the two composers. Bach's Baroque compositional style utilizes techniques of counterpoint, Harmonic phrasing as well as consistency in tonality and dynamics. Bach is known as the "father of harmony" due to his emphasis on consonance, long-flowing melodic lines, long legato phrases, and the use of harpsichord or the harp. On the other hand, Beethoven's work from the Classical/Romantic periods is known for his emotionally intense composition style in music known for its chaos, dissonance, and intentionally-provocative nature which may stir forms of uneasiness and stress on the listener. These irregular chord structures heighten amygdala activity and skin-conductance responses as well as stimulate the autonomic nervous system.[15]

Other studies suggested that different types of music may vary in their effect on cardiovascular outcomes. In a randomized study, music by Mozart (Classical era) and Strauss (Romantic period) lowered participants' blood pressure and heart rate whereas music by ABBA (pop music) did not.[16] Compared to the other music genres, Mozart's music had the most significant effect.[16] Another randomized clinical trial demonstrated that patients with myocardial infarction who listened to classical music by Mozart had a reduction in systolic blood pressure when compared to those who listened to rock and roll collection by the Beatles or a radio station with news.[17]

Conclusion

Hypertension is an important modifiable risk factor, which contributes significantly to cardiovascular morbidity and mortality. Novel lifestyle modifications such as music therapy may play a role to favorably lower blood pressure and heart rate, especially for patients with comorbidities such as anxiety. To further assess the efficacy of music intervention as a mode of therapy in patients with hypertension, we need well-designed, randomized trials are needed. Various types of music, including patient-selected music, as well as other parameters such as optimal duration, timing, and frequency of music therapy should be investigated. In the interim, the potential benefit of music therapy should be considered as hypertension treatment given its safety as well as low-cost.

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