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A singing intervention for preoperative hypertension prior to total joint replacement: Case Report

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INTRODUCTION

Traditional therapy for pre-operative hypertension consists of pharmacological interventions, including diuretics, beta blockers, calcium channel blockers, and angiotensin converting enzyme (ACE) inhibitors, among others. Although these medications typically lower blood pressure to levels acceptable for surgery, a proportion of patients do not respond. In such refractory cases, clinicians may seek alternative forms of hypertension treatment.

The salubrious effects of music therapy on both preoperative anxiety and blood pressure management have been reported in prior studies.[1-9] Fourteen randomized controlled trials have examined the use of music as an antihypertensive or anti-anxiety therapy (e.g. references [3, 7, 10, 13, 14]). Overall, these studies suggest that *listening* to music can be effective in reducing blood pressure preoperatively by calming or diverting patients, thereby lowering stress and anxiety.

We report the case of a 76-year-old female with chronic stable hypertension who experienced severely elevated blood pressure prior to total knee replacement that was unresponsive to aggressive pharmacological therapy. Her blood pressure dropped dramatically when she sang several religious songs. This case adds to prior literature by pointing to the possible therapeutic effects of *producing* music, as distinct from *listening* to music, in the preoperative setting.

CASE REPORT

The patient was a 76-year-old Dominican female with hypertension and a 15-year history of bilateral knee osteoarthritis (OA). She had been taking ACE inhibitors and calcium channel blockers for her blood pressure and managed her knee pain with the non-steroidal anti-inflammatory drug (NSAID) diclofenac. Her medical history was also notable for hyperlipidemia and mild obesity, with a body-mass index (BMI) of 30.9. She lived with her two daughters in the nation's capital, Santo Domingo, and had been washing clothing for a living until her OA made her work too painful.

The patient was accepted into Operation (Op) Walk Boston, a philanthropic program that provides total joint replacement to poor Dominican patients with advanced OA of the hip or

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knee. She was admitted to Hospital General de la Plaza in Santo Domingo for bilateral total knee replacement on March 18, 2010, with surgery scheduled for March 20th.

Her blood pressure on admission was 160/90, controlled by her usual regimen of Nifedipine 30 mg PO BID and Lisinopril 20 mg PO QD. Her urinanalysis was normal as were levels of serum electrolytes and creatinine. Two days later, on the morning of surgery, her blood pressure had climbed to 240/120 while she waited in the pre-operative holding area. These high readings persisted as the patient was brought to the operating room. The anesthesiology team decided to send her back to the floor for additional blood pressure management, with surgery tentatively postponed until the following morning.

The authors of this piece had the privilege of serving on the patient's medical team. Further blood pressure therapy was started immediately after the postponed surgery with an additional dose of Nifedipine 30 mg PO and a bolus of Lasix 20 mg IV. Despite these measures, her systolic pressure hovered around 200 mmHg throughout the afternoon. The atmosphere in the hospital room was tense, the patient's face contorted with worry as she seemed acutely aware of the high stakes: the Op Walk team would only be at the hospital for a few more days, thus if her blood pressure did not respond, she would not receive her joint replacement for a year at best, and perhaps not ever.

In late afternoon, as we checked in at her bedside, the patient asked tentatively and plaintively: "*¿Me permiten cantar?*" May I sing? "*Como no*," we replied. Of course.

And sing she did. Softly at first but with increasing volume and passion, the patient sang a half dozen religious songs that invoked Jesus, God and her Savior to protect the innocent and ill, bring peace, spread truth and heal souls. She was a Seventh Day Adventist and attended church several times each week where she sang regularly. She told us that she also sang frequently at home to cheer herself up or calm herself down, and that she sang herself to sleep many nights. She sang when she was worried.

After two songs we checked her blood pressure: 180/90. A few songs later, we obtained another reading showing that her pressures had dropped to below 180 systolic. The lower pressures persisted throughout approximately twenty minutes of singing and several hours thereafter.

That evening, we signed her out to the night shift as "sing ad lib" and indeed she sang softly at various times throughout the night. The patient's blood pressures remained acceptable through the night and the next morning. She was cleared for surgery and underwent a successful, uneventful bilateral total knee replacement. She experienced no surgical complications and had no difficulty with postoperative blood pressure management.

DISCUSSION

We report the case of a Dominican woman with chronic hypertension whose pre-operative evaluation showed severely elevated blood pressures that resulted in postponement of surgery until the next day, pending successful control of hypertension. Pharmacologic therapy was unsuccessful but the patient's singing produced an immediate and sustained reduction in blood pressure. The patient underwent bilateral total knee replacement the following day with an uncomplicated post-operative course.

Several prior studies have investigated the effect of music on hypertension both in the pre-operative setting and longitudinally. One trial involving 207 patients who were randomized to receive diazepam or listen to music on the day of and the day preceding surgery found that music was as effective as the prescription benzodiazepine for reducing blood pressure.[3]

More recently, a digital audio player (mp3) that measures a patient's blood pressure and chooses songs based on these pressures has been shown to reduce hypertension.[9] In addition, research has demonstrated the therapeutic effects of music on both pain in general and in chronic arthritis specifically. A meta-analysis of 51 randomized controlled trials evaluating the effects of music on all types of pain concluded that listening to music reduces both pain intensity levels and opioid requirements by a small extent.10 Another study that randomized 66 patients with chronic OA to either listen to 20 minutes of music daily or to sit quietly for an equal duration found a significant decrease in self-reported pain among the experimental group.11 A third study involving 30 patients with rheumatoid arthritis showed that pain perception was reduced 1 – 2 hours after listening to music.12 Mechanisms proposed for the analgesic affect of music include improvement of mood, distraction from disease, relaxation, and enhancement of release of natural opiates, all of which may modulate the transmission or perception of pain. Together, the above studies suggest that both high blood pressure and chronic arthritic pain can be ameliorated by listening to music. However, unlike patients involved in these studies, who *listened* to music, the patient described in our report *produced* her own music.

Singing differs from listening to music in several ways. First, singing is a form of self-expression that allows individuals to vocalize their emotions. This is comparable to the communication of fears and hopes through speech, which has been used to both reduce anxiety and improve a person's sense of self-control.[13] Second, singers choose the songs they wish to sing. Prior studies have suggested that listening to different types of music may produce varied physiological effects by synchronizing cardiovascular rhythms to the unique crescendos and emphases of the songs.[14] Singers may select musical characteristics such as rhythm, pitch and tempo that provide the strongest therapeutic effects. They are also able to choose songs with personal significance, such as those that help them recall positive memories and emotions, thus improving mood and lowering blood pressure. In our case, the patient was a devoted Seventh Day Adventist and chose to sing about themes central to her faith. Lastly, actively singing songs to provide comfort during times of stress and hardship suggests a belief in the power of music. The benefits of music may be contingent upon the strength of this belief in its powers. In this regard, the effects of singing may be similar to those of prayer and religion, which studies have suggested may also improve health status.[15] Thus singing may produce benefits in addition to those gained from listening to music.

Singing is simple, safe, and cost-free. Our case suggests that patients should be encouraged to sing should they wish. Our patient reported feeling inhibited from singing as she was afraid to disturb the three fellow patients with whom she shared a hospital room. Hospitals might consider providing accommodations for patients who choose to sing. Naturally, a single case suggests a hypothesis and not a conclusion. Our patient, who sang during a variety of anxiety-reducing and painful situations related to her OA, provides motivation for a rigorous study of the effects of singing on blood pressure and on pain relief. If singing is indeed found to be an effective therapy, it may be formally considered as an alternative or adjuvant treatment for both reducing chronic pain and facilitating surgical interventions experienced by patients with arthritis.

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