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RAPID COMMUNICATION

Effect of music on patients undergoing outpatient colonoscopy

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Abstract

AIM: To evaluate the effect of relaxing music during colonoscopy under low-dose conscious sedation, on patient satisfaction, scope insertion time and procedure duration, medication doses, and the perceived adequacy of sedation and scope insertion difficulty on the part of the endoscopist.

METHODS: One hundred and sixty-seven consecutive adult outpatients presenting for routine colonoscopy under low-dose conscious sedation were randomized to undergo their procedures either with music played during the procedure or no music played.

RESULTS: There were no statistical differences between the two groups in terms of meperidine dose, midazolam dose, time to reach the cecum, total procedure time, endoscopist assessment of scope insertion difficulty, endoscopist assessment of adequacy of sedation, or the pain experience of the patients during their procedure. The music group did report significantly better overall procedure satisfaction as compared to the non music group on two of our three different scales.

CONCLUSION: While music does not result in shortened procedure times, lower doses of sedative medications or perceived patient pain, the patients who have music playing during their procedures report modestly greater satisfaction with their procedures.

Key words: Colonoscopy; Gastrointestinal endoscopy; Music; Music therapy; Relaxation music

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INTRODUCTION

Colonoscopy plays an important role in the prevention of colon cancer through the diagnosis and removal of premalignant polyps. It is also the most accurate diagnostic tool for the detection of inflammatory bowel disease and many other structural lesions of the colon. Patient satisfaction with a particular medical procedure, including colonoscopy, reflects a number of variables, including the amount of anxiety prior to the procedure and the amount of anxiety and discomfort during it[1]. Anxiety about a procedure and fear of pain are also the reasons why some patients refuse endoscopic procedures for colon cancer screening[2].

The therapeutic uses of music have involved a number of disciplines of medicine, including cardiology, radiology and pulmonary medicine. For instance, studies have shown that music may decrease the anxiety of patients admitted to coronary intensive care units following cardiac surgery, and of patients undergoing stressful procedures like magnetic resonance imaging and bronchoscopy[3-6]. Studies of patients undergoing gastrointestinal endoscopic procedures have also shown that music tends to decrease patient anxiety[7-9]. However, the effects of music have been much more inconsistent when one looks at other outcomes such as pain, procedure time, doses of sedative medications, and patient vital signs. Some studies have reported shorter procedure times[10] and a reduced need for sedative medications[10-12] in colonoscopy patients who listen to music.

We conducted a randomized controlled trial of the use of relaxing music during outpatient colonoscopy done under low-dose conscious sedation, to examine its effects on patient satisfaction and pain, and to see if music has any beneficial effects on endoscopic parameters including colonoscope insertion time, medication doses, and insertion difficulty and adequacy of sedation from the standpoint of the endoscopist.

MATERIALS AND METHODS

The study was approved by the Institutional Review Board of the University of Missouri-Columbia. One-hundred and sixty-seven consecutive patients presenting for elective outpatient colonoscopy were offered entry into this prospective study. Patients were only told that we were collecting information to assess their attitudes regarding colonoscopy before and after the procedure. They were not told that they were participating in a study to assess the beneficial effects of music. Exclusion criteria were: patients

with a history of prior colon resection, patients scheduled to undergo same-day esophagogastroduodenoscopy (EGD) and colonoscopy, and inability to give informed consent. One patient declined to participate in the study.

The study was single-blinded (from the standpoint of patients). Patients agreeing to participate in the study were randomized to either a music group or a non music group. Randomization was carried out by the use of opaque envelopes, half of which containing a piece of paper that said "music," and the other half containing a piece of paper that said "no music." In the music group, a CD player was playing relaxing music upon the entrance of the patient into the procedure room. We played the same music for all patients in the music group: "Watermark" by Enya (Reprise Records, a Time Warner Company, 1988), which contains 12 tracks (ranging from 1:59 to 4:25 in length). The CD was set on repeat.

Before starting any procedures, patients were given a written questionnaire, administered by one of the investigators (RAP). Patients rated their anxiety about having the colonoscopy on a visual linear analog (VLA) scale[13], in which the patient was asked to place a mark, representing anxiety, on a 100-mm long line, that was scored from 0 to 100, with 0 representing "not anxious at all" and 100 representing "extremely anxious".

All procedures were performed by one of the four experienced gastroenterologists utilizing Olympus colonoscopes (Olympus America Inc, Melville, NY). Trainees were not involved in any of the procedures. Patients were sedated with meperidine and midazolam. Procedures were started after the patient received 50 mg of meperidine and 1 or 2 mg of midazolam. Additional medication was given at the discretion of the endoscopist.

Procedures were timed by one of the investigators (RAP) who observed all the procedures quietly in the room. This investigator recorded the time required to reach the cecal base (insertion time) and the total procedure time.

After each procedure, the endoscopist graded the procedure difficulty on two scales. The "insertion difficulty Ⅰ scale" is a 100-mm VLA scale where 0 represents "very easy" and 100 represents "very difficult". The "insertion difficulty Ⅱ scale" is a five-point scale: 1 = very easy; 2 = relatively easy; 3 = average; 4 = somewhat difficult; and 5 = very difficult. The endoscopist also graded the adequacy of sedation on a four-point scale: 1 = satisfactory; 2 = anxious; 3 = agitated; and 4 = combative.

Following all procedures and just prior to discharge, the patients were given a written post-procedure questionnaire by the same investigator to assess their experience/satisfaction. The "experience Ⅰ scale" is a four-point scale which includes the following responses: 1 = pleasant; 2 = tolerable; 3 = difficult; and 4 = unacceptable. The "experience Ⅱ scale" is a five-point scale which includes the following responses: 1 = much better than I expected; 2 = somewhat better than I expected; 3 = about what I expected; 4 = somewhat worse than I expected; and 5 = much worse than I expected. The "experience Ⅲ scale" is a 100-mm VLA scale where 0 represents "pleasant", and 100 represents "worst experience I ever have". The "pain experience scale" is a 100-mm VLA scale where 0 represents "not painful at all" and 100 represents "unbearable". Patients were also asked if they would like to have "relaxing music" played at their next colonoscopy.

Table 1 Population demographics and results of pre-procedure patient questionnaires

	Music (n = 85)	No music (n = 81)	P
Age (yr)	58.5	54.1	0.036
Gender (% females)	51.8	48.1	0.64
Prior colonoscopy (%)	36.5	30.9	0.45
Pre-procedure anxiety (mm)	36.3	45.1	0.053

The sample size of our study was estimated based on the data obtained during previous trials we performed on colonoscopy, so that we could detect a difference in the mean procedure time of 3 min between the two groups. Descriptive statistics were used to summarize baseline and outcome variables of the two groups. Mean was used to summarize normally or approximately normally distributed continuous variables. Median was used to summarize non-normally distributed ordinal variables. Proportion was used to summarize nominal variables. Chi-square test and Fisher's exact test were used to compare categorical variables. Both parametric (t-test) and non-parametric (Wilcoxon rank-sum test) tests were used to compare continuous variables. $P < 0.05$ was considered statistically significant.

RESULTS

Table 1 summarizes the population demographics and results of the pre-procedure patient questionnaires for the music and non-music groups. They were similar in terms of gender (51.8% females for the music group *vs* 48.1% for the non-music group, $P = 0.64$) and history of prior colonoscopy (36.5% *vs* 30.9%, $P = 0.45$). The music group was slightly older (58.5 years *vs* 54.1 years, $P = 0.036$), and reported less pre-procedural anxiety (36.3-mm *vs* 45.1-mm, borderline significance at $P = 0.053$).

The indications for colonoscopy were colorectal cancer screening in 24, rectal bleeding in 67, positive fecal occult blood test in 13, anemia in 8, polyp follow-up in 24, chronic diarrhea in 15, change in bowel habits in 9, abdominal pain in 4, and ulcerative colitis surveillance in 2. The distribution of indications in the two groups was similar.

The results of various colonoscopy outcomes and the results of post-procedure questionnaires given to endoscopists are given in Table 2. There was no difference between the two groups in terms of doses of sedative medications, time to reach the cecum, total procedure time, perceived colonoscope insertion difficulty, or perceived adequacy of sedation.

The results of post-procedure patient questionnaires are given in Table 3. Patients reported a better overall experience on the three experience scales, though the difference only attained a statistical significance on the experience Ⅰ and Ⅲ scales ($P = 0.045$ and $P = 0.037$ respectively, compared to $P = 0.080$ for the experience

Table 2 Procedure outcomes and results of the questionnaire given to endoscopists

Outcome	Music (n = 85)	No music (n = 81)	P
Meperidine dose (mg)[1]	57.0	54.6	0.68
Midazolam dose (mg)[1]	1.92	1.85	0.46
Time to reach cecum (min)[1]	10.4	9.2	0.46
Total procedure time (min)[1]	20.7	21.0	0.84
Insertion difficulty Ⅰ scale (mm)[1]	40.9	36.5	0.47
Insertion difficulty Ⅱ scale (1-5)[2]	3	3	0.31
Adequacy of sedation scale (1-4)[2]	1	1	0.093

[1] Mean value; [2] Median value.

Table 3 Post-procedure patient questionnaire results

Outcome	Music (n = 85)	No music (n = 81)	P
Experience Ⅰ scale (1-4)[2]	2	2	0.045
Experience Ⅱ scale (1-5)[2]	1	2	0.080
Experience Ⅲ scale (mm)[1]	22.5	28.1	0.037
Pain experience (mm)[1]	25.3	25.4	0.8
Want music at next colonoscopy (%)	96.3	56.1	< 0.0001

[1] Mean value; [2] Median value.

Ⅱ scale). The perception of pain in the two groups was similar when compared using unpaired t-test (P = 0.8). More patients in the music group requested music at the next colonoscopy (P < 0.0001).

DISCUSSION

Music has been proposed as a useful adjunct for patients undergoing a variety of medical experiences and procedures, including gastrointestinal endoscopy. Music trials relating to gastrointestinal (GI) endoscopic procedures, can be categorized as those that have examined flexible proctosigmoidoscopy[7,8], colonoscopy[9-12], and a mix of upper endoscopy and colonoscopy[14-16]. The one consistent effect that therapeutic music seems to have beneficial effects in the setting of GI endoscopy is to decrease procedure-related anxiety[7-9,16]. Consistent with the anxiolytic effects of music is the observation that music may also decrease heart rates and blood pressure values in patients undergoing lower GI endoscopic procedures[7,12].

However, the effects of music on other outcomes besides anxiety have been much less consistent. Two small studies, one involving 50 flexible sigmoidoscopy patients[7] and the other involving 32 colonoscopy patients[12], showed that the reduction of heart rate and blood pressure values is associated with music. However, no difference has been seen in music-associated vital signs in a trial of 198 patients undergoing upper endoscopy and colonoscopy[16]. Three music trials in colonoscopy patients found that the need for sedative medications is reduced in patients listening to music[10-12], while a trial of music in upper endoscopy and colonoscopy patients has found no difference[5]. A small trial of patients undergoing flexible proctosigmoidoscopy[8] reported that abdominal pain is less severe in patients listening to music. However, other GI endoscopic trials have not found any difference in pain scores[11,15].

Our randomized controlled trial examined the use of music in the outpatient colonoscopy setting in adult patients receiving relatively light conscious sedation (the mean dose of meperidine and midazolam in our patient population was approximately 50 mg and 2 mg respectively). We observed a modest improvement in the overall satisfaction with the colonoscopy experience in patients who listened to music. The music group also expressed a strong preference for having music played again if they would undergo another colonoscopy in the future. However, we found no difference in patients' perception of pain, colonoscope insertion time, total procedure time, doses of sedative medications, or endoscopists' ratings of the difficulty of scope insertion and adequacy of sedation.

Our study has several limitations and weaknesses. First, our results are only applicable to colonoscopy patients who receive light conscious sedation. In many, even most practice settings in America at the present time, patients undergoing colonoscopy are sedated substantially heavier than our patients were sedated in this study.

Second, the benefits of music we observed are modest. We employed just one selection of music for all patients. It is possible that giving patients many more selections and letting them select the music they want would result in greater benefits. This would also be made easier by letting patients use headphones.

Third, the baseline characteristics of the two groups are different. The music group was somewhat older and expressed less pre-procedure anxiety as compared to the non music group. However, since the music group was older and less anxious than the non music group, one might have anticipated that medication administration should have been much less for the music group, assuming that music decreases medication administration. To the contrary, sedative medication doses were not statistically different between the two groups. Therefore, the amount of sedative medication was not benefited from the use of music during colonoscopy.

In conclusion, our study demonstrates that the use of relaxing music during colonoscopy performed under light conscious sedation can modestly improve the overall patient satisfaction. However, in contrast to some other published trials, we did not find a benefit in terms of shortening scope insertion or procedure times, reducing sedative medication doses, or decreasing patients' perceptions of pain. Nonetheless, the observation that music can improve patient satisfaction provides a rationale for its use as a safe adjunct during colonoscopy procedures when light conscious sedation is used. Specific areas in need of further investigation include the role of patient-selected music, the best way to deliver music, the role of music before and during recovery from procedures, and the use of combined audio-visual stimulation in the improvement of patient satisfaction at colonoscopy.

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COMMENTS

Background

Over the years, music has been used as a therapeutic modality in numerous disciplines of medicine to help reduce anxiety. Though studies of the use of music as an adjunct to GI endoscopic procedures are limited, it has been suggested that relaxing music might reduce anxiety, shorten procedure time, and reduce the doses of sedative medications needed.

Research frontiers

Further research is needed to better define how music can be used to improve patient satisfaction and other outcomes associated with GI endoscopy. Specific areas in need of further investigation include the role of patient selected music, the best way to deliver music, the role of music before and during recovery from procedures, and the use of combined audio-visual stimulation.

Innovations and breakthroughs

Our study demonstrates that the use of relaxing music during colonoscopy performed under light conscious sedation can modestly improve the overall patient satisfaction. However, in contrast to some other published trials, we did not find a benefit in terms of shortening scope insertion or procedure time, reducing sedative medication doses, or decreasing patients' perceptions of pain. Nonetheless, the observation that music can improve patient satisfaction provides a rationale for its use as a safe adjunct during colonoscopy procedures, particularly when light conscious sedation is used.

Applications

The results of our study and others published in the field support the use of relaxing music during colonoscopy done under light conscious sedation as a way of improving patient satisfaction and possibly decreasing patient anxiety. The results also provide impetus for the study of relaxing music in patients being prepared for and awaiting their procedures, and during their post-procedure recovery.

Peer review

The paper provides support for the practice of using relaxing music during colonoscopy procedures done under light conscious sedation.

S- Editor Liu Y **L- Editor** Wang XL **E- Editor** Liu WF