

Effect of Music on Patients Undergoing Colonoscopy

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Introduction

A survey of American College of Gastroenterology members published in 2006 showed that 98.8% of colonoscopies utilized intravenous sedation.¹ Certainly, the vast majority of patients in the US want to be sedated for colonoscopy, and, in fact, many have the expectation “to be put out” or that at least they will feel no pain or discomfort during the procedure. Questionnaire studies in the US suggest that less than 5% to 20% of patients express even a willingness to consider unsedated colonoscopy.¹⁻⁴ However, it is well known that sedation accounts for a substantial proportion of the costs and complications of the procedure.

The first author’s own interest in unsedated and light sedation colonoscopy dates back many years. For instance, he underwent an unsedated colonoscopy in the early 1990s after turning 40 years of age, primarily with the intent of seeing how uncomfortable it was so that it would help him to offer the service to patients. Our group also did a patient questionnaire study in the late 1990s of our three practice settings (university medical center, a cancer center, and a VA medical center) examining patient attitudes toward unsedated colonoscopy.² Also, until the last five years, the endoscopy units in which the first author practiced had minimal recovery room space. This meant that the endoscopist had to become technically proficient in colonoscopy (including loop prevention) so that just light conscious sedation could be used in an effort to shorten recovery time and improve room turnover. In various endoscope trials performed by the first author (prior to five years ago), the mean doses of meperidine ranged from just 50-60 mg and the mean doses of midazolam ranged from just 1.5 to 2.5 mg.⁵⁻⁷

A number of studies through the years have examined whether having patients listen to relaxing music decreases anxiety, pain,

and sedation requirements associated with invasive procedures. These have included trials specifically examining upper GI endoscopy and colonoscopy. The purpose of this paper is to review the published experience examining the effect of music on patients undergoing outpatient colonoscopy.

The Music Study at the University of Missouri

In 1999, our group performed a randomized controlled trial of 167 consecutive adult outpatients presenting for routine colonoscopy under low-dose conscious sedation utilizing meperidine and midazolam. It was published in 2006.⁷ In our study, which was approved by our Institutional Review Board, patients did not know that they were participating in a study examining the effects of music. They were only told that the investigators were collecting information to assess their attitudes regarding colonoscopy before and after the procedure. Patients were randomized to undergo their procedures either with music playing in the procedure room or no music played. The same music was played for all patients in the music group: “Watermark” by Enya (Reprise Records, a Time Warner Company, 1988), which contained 12 tracks (ranging from 1:59 to 4:25 in length). The CD player was set on repeat. The mean age of patients was mid-50s, and the gender makeup of participants in the study was 50% males and 50% females.

As shown in Table 1, 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 insertion difficulty I scale was a visual linear analog [VLA] scale where 0-mm represented “very easy” and 100-mm represented “very difficult.” The insertion difficulty II scale was a five-

Table 1: 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

¹Mean value; ²median value.

Adapted from: *World J Gastroenterol.* 2006;12:7309-7312

point scale which ranged from 1=very easy to 5=very difficult. The adequacy of sedation was a four-point scale which ranged from 1=satisfactory to 4=combatative.)

Table 2 shows the results of the post-procedure patient questionnaires. Patients reported a better overall experience on the three experience scales, though the difference only attained 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 II scale). The perception of pain in the two groups was similar. Many more patients in the music group requested music at the next colonoscopy. (The experience I scale was a four-point scale which went from 1=pleasant to 4=unacceptable. The experience II scale was a five-point scale which went from 1=much better than I expected to 5=much worse than I

Table 2: 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

¹Mean value; ²median value.

Adapted from: *World J Gastroenterol.* 2006;12:7309-7312

expected. The experience III scale was a 100-mm VLA scale where 0-mm represented pleasant and 100-mm represented the worst experience the patient ever had. The pain experience scale was a 100-mm VLA scale where 0-mm represented "not painful at all" and 100-mm represented "unbearable.")

We concluded that, 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 at least report modestly greater satisfaction with their colonoscopies.

Meta-Analysis of Randomized Controlled Trials Looking at the Effect of Music on Patients Undergoing Colonoscopy

Randomized controlled trials (RCTs), which have examined the benefits of music during colonoscopy, have shown varying results. Meta-analysis is a useful statistical technique that can help answer clinical questions where the results of multiple clinical trials have shown variable results. Our group recently conducted a meta-analysis to analyze the effect of music on patients undergoing colonoscopy.⁸ We only included RCTs on adult subjects that compared music versus no music during colonoscopy. Meta-analysis was analyzed for total procedure times, doses of sedative medications, patients' pain scores, patients' experience, and patients' willingness to repeat the procedure in the future. Eight studies, involving 712 patients, met inclusion criteria.⁷⁻¹⁵ Table 3 lists the characteristics and Jadad scores for the eight trials. The Jadad score is a method to assess the quality of RCTs.¹⁶

Table 4 summarizes the results of our meta-analysis. Patients' overall experience scores were significantly improved with music (P < 0.01). However, no significant differences were found for mean doses of meperidine (P = 0.23), mean doses of midazolam (P = 0.10), total procedure time (P = 0.06), patients' pain scores (P = 0.09), and patients' willingness to repeat colonoscopy in the future (P = 0.10). No publication bias, evaluated by funnel plot, was identified.

Since the publication of our meta-analysis, there have been no other trials specifically evaluating the effects of music on colonoscopy. One trial evaluated the effect of music to reduce anxiety in patients undergoing GI endoscopy in general.¹⁷ They found significantly less anxiety in patients undergoing lower GI endoscopy who listened to music. However, the study did not separate colonoscopy procedures from flexible sigmoidoscopy procedures. This study also did not look at other outcomes, such as medication doses for procedures.

Discussion

Results of our own RCT and our meta-analysis examining the RCTs which have studied the effects of music on colonoscopy demonstrate that music played during colonoscopy significant-

Table 3: Studies included in the meta-analysis^{7,9-15}

AUTHOR	PUBLICATION YEAR	COUNTRY	NUMBER OF PATIENTS	TYPE OF STUDY	TYPE OF MUSIC	JADAD SCORE
Schiemann	2002	Germany	119	RCT	Variety radio station	2
Lee	2002	China	110	RCT	Variety per patient	5
Smolen	2002	USA	32	RCT	Variety per patient	2
Andrada	2004	Spain	118	RCT	Classical	3
Uedo	2004	Japan	29	RCT	Easy listening	2
Bechtold	2006	USA	166	RCT	Relaxing-Enya	3
Harikumar	2006	India	78	RCT	Variety per patient	5
Ovayolu	2006	Turkey	60	RCT	Turkish classical music	3

* = Jadad score is a method to assess the quality of RCTs.; Adapted from: *Dig Dis Sci.* 2009;54:19-24

ly improves patients' overall colonoscopy experience.^{7,8} This benefit is most likely the result of music's role in decreasing anxiety and promoting patient relaxation during a stressful procedure.¹⁷ In our trial and meta-analysis, utilizing music during colonoscopy did not demonstrate a significant reduction in doses of sedative medications, patients' pain, or increase the willingness of patients to repeat colonoscopy in the future. The meta-analysis had several weaknesses. For one thing, the music utilized in the study was highly variable in its type, timing, and mode of delivery. For instance, the type of music utilized ranged from relaxing classical music to patient-directed selections. The optimal type of music and its mode of delivery remain to be defined. Also, a majority of the studies were not blinded to the endoscopist, though it is unlikely that this would affect outcome variables such as doses of sedative medications and procedure times. The meta-analysis also included studies from many different countries and areas of the world, which may have influenced the results by increased heterogeneity.

Another meta-analysis has recently been published by Tam et al.,¹⁸ which showed somewhat different results from our meta-analysis.⁸ Whereas our meta-analysis demonstrated that music during colonoscopy did not significantly decrease sedation medication doses, Tam et al. demonstrated a small but significant decrease in sedation medication requirements (MD -0.46; CI: -0.91 – -0.01, $p=0.05$).¹⁸ However, our meta-analysis only used studies involving midazolam, whereas Tam et al. included a study in their analysis, which used propofol rather than midazolam for sedation.¹⁰ Given the differences between propofol and midazolam for sedation and that the other trials on the subject utilized midazolam, we believed that adding the propofol study to the analysis on sedative medicine doses could be misleading and potentially result in inaccurate results, particularly since the margin of significance was borderline at $p=0.05$ anyway. Both meta-analyses otherwise share similar limitations

related to the designs of the original RCTs. However, in view of the discussion above, we feel our study may be more accurate as regards the effect of music on sedative doses of medications during colonoscopy.

None of the music studies to date have specifically examined the benefit of music in patients undergoing unsedated colonoscopy. However, extrapolating the results of the available studies and of our meta-analysis suggests that the benefit would likely be modest at most. On the other hand, given the simplicity of permitting patients to listen to music in the endoscopy suite, its use should be encouraged in patients undergoing unsedated colonoscopy and colonoscopy utilizing low-dose conscious sedation. Further trials are needed to define the optimal type of music for patients and its mode of delivery.

Table 4: Summary of meta-analysis

IMPROVED WITH MUSIC	
Patients' overall experience	$p < 0.01$
NO SIGNIFICANT DIFFERENCES	
Mean doses of meperidine	$p = 0.23$
Mean doses of midazolam	$p = 0.10$
Total procedure time	$p = 0.06$
Patients' pain scores	$p = 0.09$
Patients' willingness to repeat	$p = 0.10$

No publication bias detected (evaluated by funnel plot).
Adapted from: *Dig Dis Sci.* 2009;54:19-24

In conclusion, music is a useful adjunct for improving patients' overall experience in centers that perform unsedated colonoscopy or that utilize low-dose conscious sedation.

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