

Prospective Study

Modern advances in reducing anxiety and pain associated with cystoscopy: Systematic review

Hossein S Mirheydar, Omer A Raheem, Fuad F Elkhoury, Ramzi Jabaji, Kerrin L Palazzi, Nishant Patel, Rogelio Du, Scott Maroney, Kyoko Sakamoto

Hossein S Mirheydar, Omer A Raheem, Kerrin L Palazzi, Nishant Patel, Kyoko Sakamoto, Department of Urology, UC San Diego Health System, San Diego, CA 92103-8897, United States

Fuad F Elkhoury, Ramzi Jabaji, San Diego School of Medicine, University of California, La Jolla, CA 92103-8897, United States
Rogelio Du, Scott Maroney, Kyoko Sakamoto, VA San Diego Healthcare System, San Diego, CA 92103-8897, United States

Author contributions: Mirheydar HS, Elkhoury FF, Jabaji R, Patel N, Du R, Maroney S and Sakamoto K contributed to conception and design; Palazzi KL contributed to acquisition of data, analysis and interpretation; all authors contributed to drafting the article and final approval; Mirheydar HS, Raheem OA and Sakamoto K contributed to critical revision.

Ethics approval: The study was reviewed and approved by the University of California, San Diego Human Research Protections Program Institutional Review Board (IRB).

Clinical trial registration: This study is registered at University of California, San Diego and the Veterans Administration San Diego Healthcare System. The registration identification number is H120134.

Informed consent: All study participants, or their legal guardian, provided informed written consent prior to study enrollment.

Conflict-of-interest: The authors have no conflicts of interest.

Data sharing: Technical appendix, statistical code, and dataset available from the corresponding author at email address: kyoko.sakamoto@va.gov. All participants gave informed consent for data sharing.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

Correspondence to: Kyoko Sakamoto, MD, Department of Urology, UC San Diego Health System, 200 West Arbor Dr. #8897, San Diego, CA 92103-8897,

United States. kyoko.sakamoto@va.gov

Telephone: +1-858-5528585

Fax: +1-619-543-6573

Received: July 23, 2014

Peer-review started: July 23, 2014

First decision: December 17, 2014

Revised: January 23, 2015

Accepted: March 4, 2015

Article in press: March 5, 2015

Published online: April 12, 2015

Abstract

AIM: To investigate if music reduces anxiety and pain in the Veterans Affairs population undergoing flexible cystoscopy.

METHODS: This study was reviewed and approved by the University of California, San Diego Human Research Protections Program Institutional Review Board. Patients were prospectively randomized to undergo flexible cystoscopy with or without music. Thirty-eight patients were randomized into either the No Music group ($n = 24$) or the Music group ($n = 14$). We used the state-trait anxiety inventory and the visual analog pain scale, respectively. Statistics were generated and compared using an independent t -test and chi-squared tests. P values < 0.05 were considered statistically significant. Outpatient cystoscopy is a safe and useful procedure employed frequently in Urology for diagnosis and evaluation of genitourinary pathologies. However, cystoscopy-related distress cannot be ignored. Three components of outpatient cystoscopy have been evaluated to improve the cystoscopic experience: local anesthetic control, cystoscopic equipment redesign and environmental modification. We reviewed the literature pertaining to these modifications.

RESULTS: The mean age was 65.3 and 67.1 years for men in the No Music and Music groups, respectively.

Although, the majority of patients in each group self-identified as Caucasians (66%), African American, Hispanic and other ethnicities represented 13%, 8% and 13% respectively. The majority of patients (68%) reported experiencing hematuria. Thirty-four percent had a history of bladder cancer, and eighteen percent had a history of prostate cancer. Ten patients (26%) admitted to taking antidepressants. Physiologic parameters that correlated to pain and anxiety (systolic blood pressure, diastolic blood pressure, and heart rate) were statistically similar in both groups prior to and after flexible cystoscopy. The median delta anxiety between the No Music and Music groups were not significantly different (0.78 *vs* -1.46), and the pain scores between the No Music and Music groups (1.5 *vs* 1.6) were not statistically different ($P = 0.28$ and $P = 0.92$, respectively).

CONCLUSION: Preliminary results demonstrate that music does not reduce anxiety or pain associated with flexible cystoscopy.

Key words: Flexible cystoscopy; Veterans; Anxiety; Music

© **The Author(s) 2015.** Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: Flexible cystoscopy is a very common in-office procedure performed in urology. There have been several technological advances made in the instrumentation of flexible cystoscopies, however, there have also been advances made in reducing patient pain and anxiety associated with this procedure such as viscous lidocaine jelly and music. We reviewed the literature on effects of modifiable factors on patient pain and anxiety associated with flexible cystoscopy, and also includes preliminary data on a Veterans Affairs randomized prospective trial evaluating the effect of classical music on pain and anxiety associated with flexible cystoscopy.

Mirheydar HS, Raheem OA, Elkhoury FF, Jabaji R, Palazzi KL, Patel N, Du R, Maroney S, Sakamoto K. Modern advances in reducing anxiety and pain associated with cystoscopy: Systematic review. *World J Transl Med* 2015; 4(1): 38-43 Available from: URL: <http://www.wjgnet.com/2220-6132/full/v4/i1/38.htm> DOI: <http://dx.doi.org/10.5528/wjtm.v4.i1.38>

INTRODUCTION

Cystoscopy is a common urologic examination indicated for a wide variety of genitourinary conditions^[1-4]. Cystoscopy was first conceptualized over two centuries ago^[5] and underwent multiple advancements in technology to allow patients to undergo the procedure with relative comfort. Regardless of the reason for the inspection, however, cystoscopy is invasive and can be

a distressing experience for patients.

Since patient distress negatively impacts adherence to cystoscopy guidelines, many studies have investigated techniques to reduce cystoscopy-associated anxiety and pain^[1]. Three general methods to alleviate pain and anxiety are local anesthetic control, cystoscopic equipment redesign, and environmental modification. Lidocaine lubricants, inhaled nitrous oxide, and anxiolytic medication have been proposed to ameliorate flexible cystoscopy-associated distress, though none sufficiently relieves patient fear, pain, and anxiety^[6-14]. The cystoscopic instrument has evolved from the rigid cystoscope to the flexible cystoscope, changing from analog visualization to digital and more recently digital high definition visualization.

For environmental modification, music is gaining increasing recognition as an effective tool to alleviate perceived pain and has been shown to be beneficial in a variety of clinical settings^[15-23]. Herein, we report the result of a prospective randomized trial of the effect of music on pain and anxiety in the Veterans Affairs patient population during flexible cystoscopy. Furthermore, we reviewed the above-mentioned three factors (local pain control, equipment redesign and environmental modification) incorporated to lessen the anxiety and pain levels during cystoscopy.

MATERIALS AND METHODS

This study was reviewed and approved by the University of California, San Diego Human Research Protections Program Institutional Review Board (IRB). Patient privacy and confidentiality are protected according to HIPAA guidelines. Following IRB approval, male patients at the Veterans Affairs San Diego Medical Center were prospectively randomized to undergo flexible cystoscopy with or without music. Thirty-eight patients were randomly assigned into one of two groups using an adaptive biased-coin randomization method: (1) the No Music group (patients did not hear music during preparation and draping of patient and anesthetization of urethra); or (2) the Music group (patients listened to the same excerpt of classical music). Inclusion criteria were age > 18 years old. There were no women in this study, although that was not an exclusion criterion. Exclusion criteria were current urinary tract infection, anatomic urethral abnormalities, and inability to complete the surveys. Patients' past medical history, including history of bladder cancer, prostate cancer, hematuria, and current or past use of anti-depressants and anti-anxiety medication, was recorded. All patients with a prior history of bladder cancer were confirmed to have had prior cystoscopy and were currently undergoing cystoscopy for surveillance, while those without bladder cancer were undergoing cystoscopy for diagnostic purposes (e.g., microhematuria). Each patient was consented for the study on the day of the procedure.

	Least anxious ←				→ Most anxious
I feel pleasant	[1]	[2]	[3]	[4]	
I feel nervous and restless	[1]	[2]	[3]	[4]	
I feel satisfied with myself	[1]	[2]	[3]	[4]	
I feel I could be as happy as others seen to be	[1]	[2]	[3]	[4]	
I feel like a failure	[1]	[2]	[3]	[4]	
I feel rested	[1]	[2]	[3]	[4]	
I am calm cool and collected	[1]	[2]	[3]	[4]	
I feel that difficulties are piling up so that I cannot overcome them	[1]	[2]	[3]	[4]	
I worry too much over something that really doesn't matter	[1]	[2]	[3]	[4]	
I am happy	[1]	[2]	[3]	[4]	
I have disturbing thoughts	[1]	[2]	[3]	[4]	
I lack self-confidence	[1]	[2]	[3]	[4]	
I feel secure	[1]	[2]	[3]	[4]	
I make decisions easily	[1]	[2]	[3]	[4]	
I feel inadequate	[1]	[2]	[3]	[4]	
I am content	[1]	[2]	[3]	[4]	
Some unimportant thought runs through my mind and bothers me	[1]	[2]	[3]	[4]	
I take disappointments so keenly that I cannot put them out of my mind	[1]	[2]	[3]	[4]	
I am a steady person	[1]	[2]	[3]	[4]	
I get in a state of tension or turmoil over my recent concerns and interests	[1]	[2]	[3]	[4]	

Figure 1 State-trait anxiety inventory.

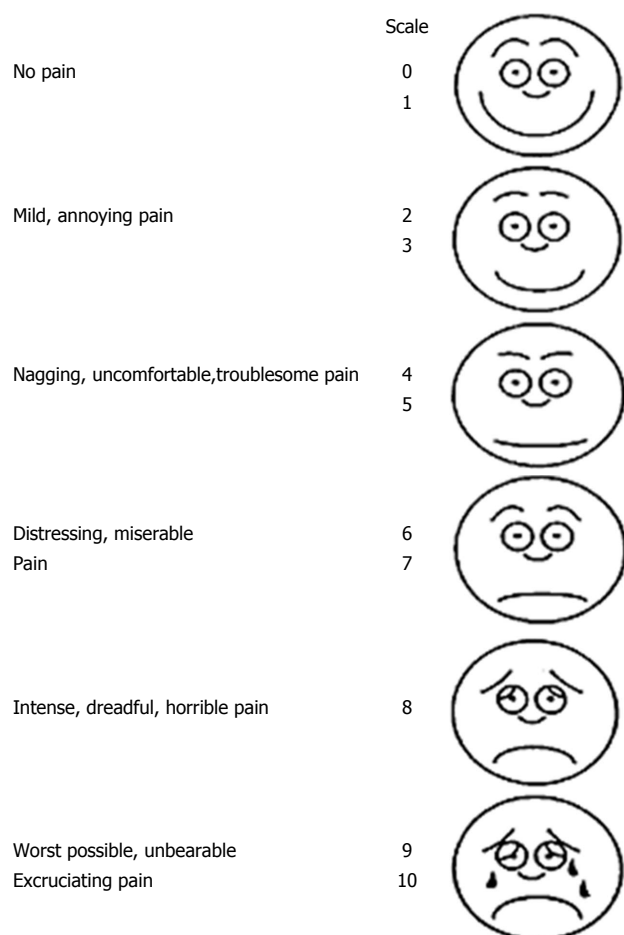


Figure 2 Visual analog pain scale.

Pre-operative and post-operative systolic and diastolic blood pressure, heart rate, and respiratory rate were measured for each patient. The pre-procedure vital signs, including blood pressure, heart rate,

and respiratory rate, were all obtained prior to the cystoscopy and prior to playing music. Post-procedure vital signs were obtained after the cystoscopy was completed. During the 10-min dwell time of the 2% intraurethral lidocaine jelly, the patient either listened to classical music for 10 min or did not hear any music at all. A 15 French Olympus® digital flexible cystoscope was connected to a digital video monitor that was used for all procedures. The music was played prior to the cystoscopy.

To measure anxiety level and pain level, we used the State-Trait Anxiety Inventory (STAI) and the Visual Analog Pain Scale, respectively (Figures 1 and 2)^[24,25]. Both are validated surveys. The State-Trait Anxiety Inventory (range 20-80) measures the transitional emotional status evoked by a stressful situation, such as a medical procedure or surgery. The Visual Analog Pain Scale (range 0-10) quantifies pain level using verbal and visual descriptors. Higher scores indicate higher anxiety and pain for both tests. The patients were asked to complete two anxiety surveys, one pre-procedure and one post-procedure. Patients were also asked to complete a visual analog pain scale survey post-procedure.

Statistics were generated and compared using an independent *t*-test and chi-squared tests. *P* values < 0.05 were considered statistically significant. Delta anxiety score is defined as pre-cystoscopy anxiety score - post-cystoscopy anxiety score.

RESULTS

Thirty-eight patients were randomized into either the No Music group (*n* = 24) or the Music group (*n* = 14). The subjects were all male as noted above. Table 1 outlines the demographics and clinical characteristics of these subjects. The mean age was 65.3 and 67.1

Table 1 Summary of patients' demographics and clinical characteristics of the music and number of music groups *n* (%)

Variables	Groups		<i>P</i> value
	Music group (<i>n</i> = 14)	No music group (<i>n</i> = 24)	
Age, mean + SD	67.1 + 9.9	65.3 + 10.4	0.9541
Race			0.698
Caucasian	10 (71)	15 (63)	
African American	1 (7)	4 (17)	
Hispanics	1 (7)	2 (8)	
Others	2 (15)	3 (12)	
History of bladder carcinoma	10 (71)	3 (1)	0.1488
History of prostate carcinoma	2 (14)	5 (21)	0.3039
History of hematuria	12 (87)	14 (58)	0.2049
Antidepressant or antianxiety medications	4 (29)	6 (25)	0.7092

Table 2 Summary of patients' peri-procedural vital signs between the music and number of music groups

Variables	Groups		<i>P</i> value
	Music group (<i>n</i> = 14)	No music group (<i>n</i> = 24)	
Pre Cystoscopy			
Systolic blood pressure (mmHg), mean + SD	135.5 + 17.7	135.5 + 17.9	0.9834
Diastolic blood pressure (mmHg), mean + SD	79.4 + 12.9	80.0 + 11.5	0.7908
Heart rate (beat/min), mean + SD	73.5 + 13.3	75.3 + 14.3	0.4405
Post Cystoscopy			
Systolic blood pressure (mmHg), mean + SD	139.1 + 22.8	137.2 + 17.3	0.5837
Diastolic blood pressure (mmHg), mean + SD	81.8 + 13.0	83.0 + 11.6	0.5717
Heart rate (beat/min), mean + SD	71.3 + 15.6	74.9 + 14.2	0.16

years for men in the No Music and Music groups, respectively. The majority of patients in each group self-identified as Caucasians. A majority of patients (68%) reported experiencing hematuria. Thirty-four percent had a history of bladder cancer, and 26% admitted to taking antidepressants. Physiologic parameters that correlated to pain and anxiety (systolic blood pressure, diastolic blood pressure, and heart rate) were statistically similar in both groups pre- and post-flexible cystoscopy. Patients' peri-procedural vital signs between the Music and No Music groups are summarized in Table 2. The median delta anxiety between the No Music and Music groups were not significantly different (0.78 vs -1.46), and the pain scores between the No Music and Music groups (1.5 vs 1.6) were not statistically different ($P = 0.28$ and $P = 0.92$, respectively).

DISCUSSION

Outpatient cystoscopy is a safe and useful procedure

employed frequently in Urology for diagnosis and evaluation of genitourinary pathologies. However, cystoscopy-related distress cannot be ignored^[1]. Three components of outpatient cystoscopy have been evaluated to improve the cystoscopic experience: local anesthetic control, cystoscopic equipment redesign and environmental modification. We reviewed the literature pertaining to these modifications. In addition, since flexible cystoscopy is a more tolerable procedure more commonly utilized in the United States, we performed this study to investigate if music reduces anxiety and pain in American veterans undergoing flexible cystoscopy.

A recent study suggests that listening to classical music during rigid cystoscopy enhances patient comfort and decreases post-procedure pain and anxiety^[23]. In addition to this report, prior studies have demonstrated music's ameliorating effect on pain and anxiety in patients undergoing a variety of procedures, including rigid cystoscopy^[16-18,20].

Contrary to these studies, our study did not show reduction of cystoscopy-related anxiety by listening to classical music during flexible cystoscopy, regardless of its indication. The lack of the effect of music in our group may be due to the small number of subjects. In addition, due to the patient demographics of the Veterans Affairs hospitals, the majority of our patients have been Caucasian males. Subsets of patients treated at the Veterans Affairs Hospitals respond to painful stimuli differently than their civilian counterparts, possibly due to the increased prevalence of PTSD and generalized anxiety disorder^[24,25]. A subset of patients with history of bladder carcinoma that required repeated surveillance using office-based flexible cystoscopies were also included in this cohort. We observed that listening to music at time of respective cystoscopy did not influence their peri-procedural STAI anxiety scores when adjusting for other variables. We included blood pressure, heart rate, and respiratory rate as objective representations of the emotional state of the patient in addition to validated questionnaires. These parameters are directly influenced by sympathetic nervous system activation due to emotional distress or anxiety through the release of catecholamines, specifically norepinephrine and epinephrine^[26,27]. Higher catecholamine levels from anxiety and fear result in elevated blood pressure, heart rate, and respiratory rate. Thus, the combination of these objective physiologic indicators with the subjective patient-provided information on anxiety and fear provided a more holistic assessment of the impact of music on how a patient experiences flexible cystoscopy.

Several randomized studies have shown the benefit of intraurethral lidocaine gel in reducing the pain associated with flexible cystoscopy and others have shown no improvement^[6,8-13]. However, a recent meta-analysis^[28] evaluating the effect of lidocaine gel on pain during flexible cystoscopy concluded that intraurethral instillation of lidocaine gel vs plain lubricating gel

reduces the likelihood of moderate to severe pain during flexible cystoscopy. Although fiber optic technology is still utilized for many of the flexible cystoscopes in the country, digital technologies are available. In other endoscopic devices, visualization using digital technology has higher resolution, decreased distortion, improved color representation, and larger image size compared with the standard fiber optic visualization with a narrower field of view^[29]. More recently, digital technology with distal sensor high definition images has been compared to standard digital visualization^[30]. These reductions will likely result in improved patient comfort during outpatient flexible cystoscopy.

Modern advances in flexible cystoscopic instrumentation and peri-procedural instillation of intraurethral lidocaine have both decreased pain associated with flexible cystoscopy. Listening to music during rigid cystoscopy has been shown to reduce pain and discomfort. Our prospective, randomized study explored the effect of classical music on pain and anxiety associated with flexible cystoscopy, and preliminarily demonstrates that music does not reduce anxiety or pain associated with flexible cystoscopy in the Veterans Affairs population.

COMMENTS

Background

Flexible cystoscopy is a very common in-office procedure performed in Urology. Several technological advances have been made in flexible cystoscopy instrumentation, however, there have also been advances in reducing patient pain and anxiety associated with this procedure, such as viscous lidocaine jelly and music. The authors reviewed the literature on effects of modifiable factors on patient pain and anxiety associated with flexible cystoscopy, and also include preliminary data on a Veterans Affairs randomized prospective trial evaluating the effect of classical music on pain and anxiety associated with flexible cystoscopy. This study explored the effect of classical music on pain and anxiety associated with flexible cystoscopy, and preliminarily demonstrates that music does not reduce anxiety or pain associated with flexible cystoscopy in the Veterans Affairs population.

Research frontiers

Flexible cystoscopy is a very common in-office procedure performed in Urology. Several technological advances have been made in flexible cystoscopy instrumentation, however, there have also been advances in reducing patient pain and anxiety associated with this procedure, such as the use of viscous lidocaine jelly and music.

Innovations and breakthroughs

In this systematic review, the authors attempted to evaluate whether listening to music at time of office-based flexible cystoscopy can alleviate pain and anxiety associated with this procedure. Previous studies have highlighted that listening to music during rigid cystoscopy reduces pain and discomfort. In contrast, they study did not show reduction of cystoscopy-related anxiety by listening to classical music during flexible cystoscopy, regardless of its indication. The lack of effect of music in their group may be due to the small number of subjects recruited in this study. Additionally, owing to the patient demographics of Veterans Affairs hospitals, the majority of our patients have been Caucasian males. Subsets of patients treated at Veterans Affairs hospitals respond to painful stimuli differently than their civilian counterparts, possibly due to the increased prevalence of PTSD and generalized anxiety disorder.

Applications

Although listening to music at time of office-based flexible cystoscopy may play a limited role in reducing pain and anxiety in the Veteran population, these findings cannot be generalized to the general patient population, particularly civilian, as responses to pain and/or anxiety associated with flexible cystoscopy

can manifest differently among heterogeneous patient populations.

Terminology

Well described medical and technological terminology commonly known to the general audience and the wider medical community was used. State-trait anxiety inventory; visual analog pain scale.

Peer-review

This study investigated cystoscopy-related distress, reviewing benefits of intraurethral lidocaine use as well as of digital cystoscopes for reducing procedural anxiety and pain. Indeed, the authors performed a study to investigate if listening to classical music reduces anxiety and pain in patients undergoing flexible cystoscopy who were treated at a Veterans Affairs hospital in the United States.

REFERENCES

- Schrag D**, Hsieh LJ, Rabbani F, Bach PB, Herr H, Begg CB. Adherence to surveillance among patients with superficial bladder cancer. *J Natl Cancer Inst* 2003; **95**: 588-597 [PMID: 12697851 DOI: 10.1093/jnci/95.8.588]
- Clark PE**, Agarwal N, Biagioli MC, Eisenberger MA, Greenberg RE, Herr HW, Inman BA, Kuban DA, Kuzel TM, Lele SM, Michalski J, Pagliaro LC, Pal SK, Patterson A, Plimack ER, Pohar KS, Porter MP, Richie JP, Sexton WJ, Shipley WU, Small EJ, Spiess PE, Trump DL, Wile G, Wilson TG, Dwyer M, Ho M. Bladder cancer. *J Natl Compr Canc Netw* 2013; **11**: 446-475 [PMID: 23584347]
- Davis R**, Jones JS, Barocas DA, Castle EP, Lang EK, Leveillee RJ, Messing EM, Miller SD, Peterson AC, Turk TM, Weitzel W. Diagnosis, evaluation and follow-up of asymptomatic microhematuria (AMH) in adults: AUA guideline. *J Urol* 2012; **188**: 2473-2481 [PMID: 23098784 DOI: 10.1016/j.juro.2012.09.078]
- Hall MC**, Chang SS, Dalbagni G, Pruthi RS, Seigne JD, Skinner EC, Wolf JS, Schellhammer PF. Guideline for the management of nonmuscle invasive bladder cancer (stages Ta, T1, and Tis): 2007 update. *J Urol* 2007; **178**: 2314-2330 [PMID: 17993339 DOI: 10.1016/j.juro.2007.09.003]
- Samplaski MK**, Jones JS. Two centuries of cystoscopy: the development of imaging, instrumentation and synergistic technologies. *BJU Int* 2009; **103**: 154-158 [PMID: 19076146 DOI: 10.1111/j.1464-410X.2008.08244]
- Birch BR**, Ratan P, Morley R, Cumming J, Smart CJ, Jenkins JD. Flexible cystoscopy in men: is topical anaesthesia with lignocaine gel worthwhile? *Br J Urol* 1994; **73**: 155-159 [PMID: 8131017 DOI: 10.1111/j.1464-410X.1994.tb07484.x]
- Callear JG**, Masood J, Van-Mallaerts R, Barua JM. Nitrous oxide inhalation to improve patient acceptance and reduce procedure related pain of flexible cystoscopy for men younger than 55 years. *J Urol* 2007; **178**: 184-18; discussion 188 [PMID: 17499771 DOI: 10.1016/j.juro.2007.03.036]
- Chen YT**, Hsiao PJ, Wong WY, Wang CC, Yang SS, Hsieh CH. Randomized double-blind comparison of lidocaine gel and plain lubricating gel in relieving pain during flexible cystoscopy. *J Endourol* 2005; **19**: 163-166 [PMID: 15798411 DOI: 10.1089/end.2005.19.163]
- Herr HW**, Schneider M. Outpatient flexible cystoscopy in men: a randomized study of patient tolerance. *J Urol* 2001; **165**: 1971-1972 [PMID: 11371893]
- Holmes M**, Stewart J, Rice M. Flexible cystoscopy: is the volume and content of the urethral gel critical? *J Endourol* 2001; **15**: 855-858 [PMID: 11724129 DOI: 10.1089/089277901753205898]
- McFarlane N**, Denstedt J, Ganapathy S, Razvi H. Randomized trial of 10 mL and 20 mL of 2% intraurethral lidocaine gel and placebo in men undergoing flexible cystoscopy. *J Endourol* 2001; **15**: 541-544 [PMID: 11465336 DOI: 10.1089/089277901750299366]
- Palit V**, Ashurst HN, Biyani CS, Elmasray Y, Puri R, Shah T. Is using lignocaine gel prior to flexible cystoscopy justified? A randomized prospective study. *Urol Int* 2003; **71**: 389-392 [PMID: 14646439 DOI: 10.1159/000074092]

- 13 **Rodríguez-Rubio F**, Sanz G, Garrido S, Sánchez C, Estudillo F. Patient tolerance during outpatient flexible cystoscopy--a prospective, randomized, double-blind study comparing plain lubrication and lidocaine gel. *Scand J Urol Nephrol* 2004; **38**: 477-480 [PMID: 15841781 DOI: 10.1080/00365590410018666]
- 14 **Song YS**, Song ES, Kim KJ, Park YH, Ku JH. Midazolam anesthesia during rigid and flexible cystoscopy. *Urol Res* 2007; **35**: 139-142 [PMID: 17415555 DOI: 10.1007/s00240-007-0091-7]
- 15 **Argstatter H**, Haberbosch W, Bolay HV. Study of the effectiveness of musical stimulation during intracardiac catheterization. *Clin Res Cardiol* 2006; **95**: 514-522 [PMID: 16897144 DOI: 10.1007/s00392-006-0425-4]
- 16 **Chan YM**, Lee PW, Ng TY, Ngan HY, Wong LC. The use of music to reduce anxiety for patients undergoing colposcopy: a randomized trial. *Gynecol Oncol* 2003; **91**: 213-217 [PMID: 14529684 DOI: 10.1016/S0090-8258(03)00412-8]
- 17 **Ferguson SL**, Voll KV. Burn pain and anxiety: the use of music relaxation during rehabilitation. *J Burn Care Rehabil* 2004; **25**: 8-14 [PMID: 14726734 DOI: 10.1097/01.BCR.0000105056.74606.9E]
- 18 **Krout RE**. The effects of single-session music therapy interventions on the observed and self-reported levels of pain control, physical comfort, and relaxation of hospice patients. *Am J Hosp Palliat Care* 2001; **18**: 383-390 [PMID: 11712719 DOI: 10.1177/104990910101800607]
- 19 **Lee DW**, Chan KW, Poon CM, Ko CW, Chan KH, Sin KS, Sze TS, Chan AC. Relaxation music decreases the dose of patient-controlled sedation during colonoscopy: a prospective randomized controlled trial. *Gastrointest Endosc* 2002; **55**: 33-36 [PMID: 11756911 DOI: 10.1067/mge.2002.120387]
- 20 **Menegazzi JJ**, Paris PM, Kersteen CH, Flynn B, Trautman DE. A randomized, controlled trial of the use of music during laceration repair. *Ann Emerg Med* 1991; **20**: 348-350 [PMID: 2003660 DOI: 10.1016/S0196-0644(05)81652]
- 21 **Ovayolu N**, Ucan O, Pehlivan S, Pehlivan Y, Buyukhatipoglu H, Savas MC, Gulsen MT. Listening to Turkish classical music decreases patients' anxiety, pain, dissatisfaction and the dose of sedative and analgesic drugs during colonoscopy: a prospective randomized controlled trial. *World J Gastroenterol* 2006; **12**: 7532-7536 [PMID: 17167846 DOI: 10.3748/wjg.v12.i46.7532]
- 22 **Tsivian M**, Qi P, Kimura M, Chen VH, Chen SH, Gan TJ, Polascik TJ. The effect of noise-cancelling headphones or music on pain perception and anxiety in men undergoing transrectal prostate biopsy. *Urology* 2012; **79**: 32-36 [PMID: 22202544 DOI: 10.1016/j.urology.2011.09.037]
- 23 **Yeo JK**, Cho DY, Oh MM, Park SS, Park MG. Listening to music during cystoscopy decreases anxiety, pain, and dissatisfaction in patients: a pilot randomized controlled trial. *J Endourol* 2013; **27**: 459-462 [PMID: 23009573 DOI: 10.1089/end.2012.0222]
- 24 **Defrin R**, Ginzburg K, Solomon Z, Polad E, Bloch M, Govezensky M, Schreiber S. Quantitative testing of pain perception in subjects with PTSD--implications for the mechanism of the coexistence between PTSD and chronic pain. *Pain* 2008; **138**: 450-459 [PMID: 18585862 DOI: 10.1016/j.pain.2008.05.006]
- 25 **Milanak ME**, Gros DF, Magruder KM, Brawman-Mintzer O, Frueh BC. Prevalence and features of generalized anxiety disorder in Department of Veteran Affairs primary care settings. *Psychiatry Res* 2013; **209**: 173-179 [PMID: 23659756 DOI: 10.1016/j.psychres.2013.03.031]
- 26 **Khasar SG**, McCarter G, Levine JD. Epinephrine produces a beta-adrenergic receptor-mediated mechanical hyperalgesia and in vitro sensitization of rat nociceptors. *J Neurophysiol* 1999; **81**: 1104-1112 [PMID: 10085337]
- 27 **Sloviter RS**, Dean E, Neubort S. Electron microscopic analysis of adrenalectomy-induced hippocampal granule cell degeneration in the rat: apoptosis in the adult central nervous system. *J Comp Neurol* 1993; **330**: 337-351 [PMID: 8468410 DOI: 10.1002/cne.903300305]
- 28 **Aaronson DS**, Walsh TJ, Smith JF, Davies BJ, Hsieh MH, Konety BR. Meta-analysis: does lidocaine gel before flexible cystoscopy provide pain relief? *BJU Int* 2009; **104**: 506-509; discussion 509-510 [PMID: 19239453 DOI: 10.1111/j.1464-410X.2009.08417.x]
- 29 **Zilberman DE**, Lipkin ME, Ferrandino MN, Simmons WN, Mancini JG, Raymundo ME, Zhong P, Preminger GM. The digital flexible ureteroscope: in vitro assessment of optical characteristics. *J Endourol* 2011; **25**: 519-522 [PMID: 21361823 DOI: 10.1089/end.2010.0206]
- 30 **Lusch A**, Liss MA, Greene P, Abdelshehid C, Menhadiji A, Bucur P, Alipanah R, McDougall E, Landman J. Comparison of optics and performance of a distal sensor high definition cystoscope, a distal sensor standard definition cystoscope, and a fiberoptic cystoscope. *Urology* 2013; **82**: 1226-1230 [PMID: 24094651 DOI: 10.1016/j.urology.2013.06.033]

P- Reviewer: Nishio K, Orlacchio A **S- Editor:** Tian YL
L- Editor: A **E- Editor:** Liu SQ





Published by **Baishideng Publishing Group Inc**

8226 Regency Drive, Pleasanton, CA 94588, USA

Telephone: +1-925-223-8242

Fax: +1-925-223-8243

E-mail: bpgoffice@wjgnet.com

Help Desk: <http://www.wjgnet.com/esps/helpdesk.aspx>

<http://www.wjgnet.com>

