Does music reduce anxiety for patients undergoing dermatological surgery? A systematic review

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Abstract

Background. The incidence of skin cancer is increasing globally, leading to a greater need for dermatologists to perform skin surgery However, skin surgery can be a potentially stressful experience for patients due to the fear of a possible cancer diagnosis coupled with anxiety related to pain and cosmetic outcomes.

Aim. To examine whether there is any evidence to support the hypothesis that listening to music during dermatological surgery under local anaesthesia can help reduce patient anxiety.

Methods. This systematic review considered all original research published until May 2020. Four relevant studies were identified, comprising a total of 381 patients (three randomized control trials and one case–control trial).

Results. Two of the four studies showed a significant reduction in perioperative anxiety in patients who had listened to music during surgery. Both of the other studies showed no statistically significant difference between music and no music for patients, although one of these noted reduced anxiety in surgeons.

Conclusion. There is currently limited evidence to support the use of perioperative music in clinical practice to reduce anxiety in skin surgery. However, given the potential benefits and the likely limited costs of this simple intervention, we believe that further research on this topic is warranted.

Introduction

Skin cancers, comprising keratinocyte cancer and melanoma, have a higher incidence in the UK and USA than all other cancers[1,2] and their diagnosis and treatment are estimated to occupy a large proportion of dermatologists' workload.[3]

Undergoing surgery is a stressful experience for many patients.[4] Skin surgery poses its own challenges because patients are usually awake. Increased stress is unpleasant for patients, and has been shown to reduce tolerance to pain and delay wound healing.[5,6] It is reasonable to expect that, during surgery, a highly stressed patient may also induce stress in the surgeon, which could affect their surgical performance.[7]

In clinical practice, little is routinely done to reduce patient anxiety during dermatological surgery unless acutely anxious patients are identified in advance, at which point anxiolytic medications are usually considered. Use of these medications involve additional costs and risks (especially in an outpatient setting) and can cause undesirable adverse effects such as postoperative drowsiness.

Anxiety can be measured using various types of visual analogue scale (VAS) and patient questionnaire (Table 1), including before and after an intervention. More objective assessments include recording physiological parameters such as blood pressure and heart rate.

Nonpharmacological methods of reducing anxiety include music, mindfulness, self-hypnosis and distraction therapies.[8–10] Of these, music is the cheapest and easiest to implement, and has the fewest risks. The relationship between music and medicine is not a new one; in ancient Greece, Apollo was the god of both music and healing, and prior to the widespread availability of adequate analgesia, music was used in the 19th century to distract patients in operating theatres from 'the horror of their situation'.[11] A recent study has shown over 90% of surgeons chose to listen to music while operating.[12] Interest has been generated about the effectiveness of music at reducing anxiety associated with medical interventions in a variety of specialities.[13–15] Notably, a randomized control trial (RCT) of 327 patients showed that listening to relaxing music preoperatively was more effective than midazolam at reducing anxiety before surgery (which was then performed under general anaesthesia in the majority of cases).[16] Patient-selected perioperative music has also been observed to reduce immune markers of stress (serum cortisol and circulating natural killer lymphocytes) in patients undergoing nondermatological day surgery.[17]

In this study, we systematically reviewed the available literature to examine whether listening to music

while undergoing skin surgery influences patient anxiety.

Methods

We conducted a systematic review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.[18] The review protocol and registration details can be found at PROSPERO, the international prospective register of systematic reviews (https://www.crd.york.ac.uk/PROSPERO; registration number: CRD42020169887).

Outcomes

The primary outcome was the degree of anxiety of patients undergoing skin surgery under local anaesthesia, who were or were not exposed to perioperative music. Outcomes were assessed using validated measures of anxiety including preoperative and postoperative visual analogue scale (VAS), the State Trait Anxiety Index (STAI) and physiological measurements (including respiratory rate).

Search Strategy

The following databases were searched from inception until May 2020: Cochrane Central Register of Controlled Trials (CENTRAL), PubMed, Embase, MEDLINE, CINAHL, BNI, EMCARE, PyscInfo, Web of Science and Google Scholar. The PICO framework (Table 2) was used to design the search strategy The following search terms were used: (anxiety OR stress OR distress OR fear OR nervousness) AND (Skin surgery OR day surgery OR dermatology surgery OR Mohs surgery OR micrographic surgery OR ambulatory surgery) AND (Music OR music medicine OR music therapy). The detailed search strategy is shown in Supplementary Table S1. These terms were agreed upon in advance by the authors. In addition, references from included papers were hand searched and a web search was performed.

Study selection

This review searched for all relevant studies, but only RCTs and case–control studies were found to be relevant to our PICO criteria. There were no restrictions on patient demographics or date of publication. Only studies looking at intraoperative music were included. Exclusion criteria included paediatric studies, non-English publications, nondermatological surgery, surgery under general anaesthetic and cosmetic surgery. Detailed inclusion and exclusion criteria are listed in Table S2.

Statistical analysis

Screening of abstracts, data extraction and quality assessment were performed independently by two authors (SS, GC), and any disagreements were resolved with the help of a third author (EH). Intervention effects were compared between studies where possible through determining standard mean difference between intervention and control groups. Potential sources of bias were considered using the revised Cochrane Risk of Bias tool.[19]

Results

Study selection

In total, 110 papers were identified; 109 of these were from database searches and 1 was found from searching the references of selected papers (Fig. 1). Of these, 32 papers were found to be duplicates or incomplete. The titles and abstracts of the remaining 78 papers were read, following which 61 papers were then excluded. Reasons for exclusion included the study not pertaining to dermatological surgery; assessing preoperative rather than perioperative intervention; including paediatric patients only; dealing with cosmetic surgery; being a commentary or review article; having no English language translation available; and looking at effects of music other than effect on anxiety. The remaining 17 papers were read in full; 13 of these were then discounted because they were not focused on skin surgery or the patients had received general rather than local anaesthesia, thus 4r studies were identified as being suitable for inclusion (Table 3).

Study characteristics

The 4 included studies had a total of 381 patients, were published from 2012 to 2016, and included three RCTs[20–22] and 1 case–control trial.[23] Anxiety in these studies was assessed in a variety of ways (Table 3).

The results of the studies are summarized in Table 4.

Results of Individual studies

Alam *et al*.[20] performed an RCT in patients undergoing excision of basal cell and squamous cell carcinomas on the face and compared three groups: patients given guided imagery ($n = 50$); patients given a standardized investigatory chosen playlist of relaxing music ($n = 54$); and a control group of patients given earphones ($n = 51$) (used as a means of blinding the surgeon, not the patient). Results for the guided imagery group were discounted for the current systematic review as they were not relevant. Alam *et al*. found no significant difference between the music intervention and the control groups in mean reduction in patient anxiety levels pre and post surgery measured by the six-item STAI (mean ± SD 9.94 ± 0.33 vs. 9.63 ± 0.38 respectively) or in pain measured by a VAS (0.41 ± 0.23 vs. 0.23 ± 0.22). Similarly, there was no difference in patient heart rate or blood pressure between the music intervention and control groups pre- and post-surgery. However, although there was no difference in patient anxiety, the authors noted that surgeon anxiety decreased more in the intervention group than the control group (mean change in STAI 10.53 ± 0.24 vs. 8.51 ± 0.25; $P < 0.05$).

Vachiramon *et al*.[21] conducted an RCT comparing patient-selected music ($n = 50$) and no music ($n = 50$) in patients undergoing Mohs micrographic surgery (MMS), with outcomes measured by VAS and STAI, both preoperatively and after the first stage of MMS. The authors found that both measures were lower after the first stage of MMS in patients who were able to listen to self-selected music compared with controls: mean ± SD STAI 28.8 ± 7.3 vs. 35.3 ± 9.7 ($P < 0.001$); VAS 2.0 ± 1.5 vs. 3.9 ± 2.4 ($P < 0.001$).

McLeod[22] performed a pseudo-RCT comparing self-selected music ($n = 40$) and no music ($n = 40$) in patients undergoing elective plastic surgery. The authors assessed anxiety pre and immediately post operatively using the 'state' part of the STAI. STAI scores in the intervention group were lower than in the control (30.52 ± 9.82 vs. 33.15 ± 10.58, respectively) but this did not reach statistical significance.

Sadideen *et al*.[23] conducted a case–control study in patients undergoing either skin surgery or washout of skin wounds under local anaesthetic. The intervention group ($n = 48$) was given easy listening or classical music, which was started before being given local anaesthetic, while the control group ($n = 48$) had no music. Anxiety was measured pre and post operatively using a VAS and respiratory rate (RR). The authors found that both VAS and RR were lower post operatively in the group exposed to music than in the control group [3.5 vs. 4.9 ($P < 0.01$); 11 vs. 13 ($P < 0.05$), respectively]. No SD or CI was reported for the study.

Fig. 2 shows a forest plot of the standard mean differences of the studies. The Sadideen *et al*. report[23] could not be included as it did not report any measure of data variability (e.g. standard deviation).

Risk of bias and discussion

This review explored the effect of perioperative music on anxiety in patients undergoing skin surgery. From the four studies identified, two studies showed a statistically significant benefit from perioperative music,[22,23] while the other two studies showed no statistical evidence of benefit[20,21] (however, one of these did show a reduction in surgeon anxiety[21]). The overall quality of the evidence (GRADE) was low.

The risk of bias was assessed as high for one study, unclear for two studies and low for one study (Fig. 3). Sadideen *et al*.[23] did not randomize or blind their patients, and outcome data were incomplete as they did not include CI or SD. Patients could not be blinded to their intervention group, but only Alam *et al*.[20] made attempts to blind the clinicians and to ensure that results were collected by a separate team to the operating clinicians. Rather than reporting anxiety pre and post surgery, these authors reported a mean change in anxiety score,[20] which made it difficult to compare with the other studies. McLeod[22] did not report patient demographics, and therefore it was not possible to assess potential confounding factors between the intervention and control groups.

In some cases, the exclusion criteria used in the studies may have fostered bias. Alam *et al*.[20] excluded patients if they had a known psychiatric condition such as anxiety or pain disorders, but it could be argued that these patients are an important group for which clinicians would want to know if perioperative music intervention has an effect. Sadideen *et al*.[23] excluded patients needing operations on the face, which many dermatological patients require; this was something that the other studies did not omit. McLeod[22] excluded patients who disclosed not liking music, which was not a factor considered in the other studies.

A previous systematic review looking at the anxiolytic effects of perioperative music in obstetrics observed that studies using the STAI were less likely to identify a positive result compared with those using the Zung Self-Rating Anxiety Scale.[24] Given that the STAI was used by three studies in this review, this may have contributed to the equivocal findings of benefit in this review.

The blinding of patients to the intervention of listening to music is clearly impossible, but it is pertinent that the only study in this review (Alam *et al*.[20]) that blinded clinicians provided earphones to the control group. These may have blocked out sounds of the operating theatre, which in itself may reduce anxiety and notably, this study found no difference between the cases and control groups.

Both Vachiramon *et al*.[21] and McLeod[22] allowed patients to self-select music, and both studies demonstrated a reduction in anxiety or improved patient satisfaction. It would make sense that, in a situation where many things are outside their control, allowing patients to choose what they will listen to (particularly if this is something familiar and liked) would lead to increased relaxation.

The limitations of this review include the low number of papers found in the literature search and the relatively small total sample size assessed. Additionally, one of the studies included some nondermatological cases (washouts of hand wounds) that were included in the analysis. Our results are subject to publication bias as we were unable to interpret abstracts where there was no English language translation available. Biases innate to the studies such as whether the same surgeon and operating team performed all of the procedures, thereby making the experience as similar as possible, were only commented on in one paper.[23] A further limitation is the varied ways chosen to assess anxiety, which made it difficult to perform quantitative comparison of the result.

Conclusion

To our knowledge, this is the first systematic review looking at the effect of music on patient anxiety in patients specifically undergoing skin surgery. Overall, there is some limited evidence to suggest a benefit of listening to music during surgery, and two studies support offering patients the option of listening to their choice of intraoperative music.

A well-designed RCT is needed to help confirm the evidence to date. We would suggest, as far as possible, avoiding confounding factors such as difference inn surgical theatre, surgeon and surgery timing, as well as documenting variables such as the site and reason for surgery. It would be worth considering the type and choice of music and ensuring that there are similar numbers in each group.

What's already known about this topic?

- Skin surgery under local anaesthesia is a commonly undertaken and potentially stressful experience for dermatology patients.
- There are limited evidence-based options for tackling perioperative anxiety in patients.
- Music is an inexpensive and easily accessible tool that may help tackle anxiety.

What does this study add?

- We systematically reviewed the available literature looking at the role of music in reducing perioperative anxiety.
- We identified that there is a limited amount of dermatology-specific research into this area, with a significant degree of heterogeneity and bias in the studies reviewed.
- There is weak evidence to show that perioperative music may help to reduce anxiety in patients and weak evidence to indicate that it may also reduce anxiety in surgeons.

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Notes:

Conflict of interest

The authors declare that they have no conflict of interest.

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Ethics statement

Ethics approval: not applicable. The patient provided informed consent for publication of their case details and images.

Data sharing

Data are available on request from the corresponding author.

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Figure 1 Search results.
Figure 2 Forest plot of standard mean differences.
Figure 3 Risk of bias.

Table 1 Anxiety assessment tools.

Tool	Description
VAS	Patients mark their perceived anxiety on a horizontal line with 'no anxiety' on left and 'worst possible anxiety' on right.
STAI	A 40-part questionnaire with 20 questions detailing current anxiety 'state' and 20 questions about patient anxiety 'trait'. Questions are answered on a 4-point Likert scale (1 = absence of anxiety, 4 = high anxiety). Maximum score is 80 for 'state' and 80 for 'trait'.
Six-item STAI	A validated shorter 6-item version of the full 40-item STAI questionnaire
BP and HR	Both can be elevated in association with increased anxiety

BP, blood pressure; HR, heart rate; STAI, State-Trait Anxiety Inventory; VAS, visual analogue scale.

Table 2 PICO framework.

*P*opulation	Patients undergoing skin surgery under LA
*I*ntervention	Perioperative music
*C*omparison	No music
*O*utcomes	Reduction in anxiety

LA, local anaesthetic.

Table 3 Study characteristics.

Reference	Country	Type of surgery	Type of study	Control	Patients, *n*	Age, years; mean (range)	Male, %	Anxiety assessment tool
Alam *et al*., 2016[20]	USA	MMS under LA	RCT	Earphones without sound	105+a	Control: 64.2; relaxing music: 62.4	58	VAS, 6-item STAI, BP and HR
Vachiramon *et al*., 2013[21]	USA	First stage of MMS under LA	RCT	No music	100	Control: 66.0 (33–88); intervention: 62.6 (30–86)	67	VAS, STAI
McLeod, 2012[22]	UK	Minor surgery for conditions such as scar revision, excision of benign skin lesions, excision of moles, skin grafting and hand surgery under LA	RCT+b	No music	80	not given	Not stated	STAI
Sadideen *et al*., 2012[23]	UK	Elective and trauma surgery under LA	Case–control	No music	96	51 (16–76)	57	VAS

LA, local anaesthetic; MMS, Mohs' micrographic surgery; RCT, randomized controlled trial; STAI, State-Trait Anxiety Inventory; VAS, visual analogue scale. [a]Study also had 50 patients who were given guided imagery; [b]pseudorandomized.

Table 4 Study results.

	Number of participants		Anxiety	Preoperative anxiety		Postoperative anxiety		Mean change	
Author, year	Control	Intervention	tool	Control	Music	Control	Music	Control	Music
Alam *et al*., 2016[20]	51	54	6-item STAI	–	–	–	–	-9.63 [NS]	-9.94 [NS]
Vachiramon *et al*., 2013[21]	50	50	STAI	38.7 (10.5)	38.7 (13.8)	35.3 (9.7)***	28.8 (7.3)***	-3.4	-9.9
	50	50	VAS	4.53 (2.5)	5.2 (2.7)	3.9 (2.4)***	2.0 (1.5)***	0.63	-3.2
McLeod, 2012[22]	40	40	STAI	38.45 (11.49)	38.50 (15.59)	33.15 (10.58) [NS]	30.52 (9.82) [NS]	-5.3	-7.98
Sadideen *et al*., 2012[23]	48	48	VAS	5.8	5.7	4.9**	3.5**	-0.9	-2.2

NS, not significant; STAI, State-Trait Anxiety Inventory; VAS, visual analogue scale. **P<0.01; ***P<0.001.

Supplementary Table S1 Detailed search strategy.
Supplementary Table S2 Eligibility criteria.