



Effect of Raag Anand Bhairavi on Postoperative Pain in Patients Undergoing Total Knee Arthroplasty: A Randomized Controlled Study

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Abstract

Background:

Total knee arthroplasty (TKA) is a common and painful orthopaedic procedure, particularly in the immediate postoperative period. Standard pain management often relies on opioids and NSAIDs, which pose risks for elderly patients with comorbidities. Non-pharmacological interventions like music therapy are increasingly explored as adjuncts to pain management. This study examines the effect of Raag Anand Bhairavi, a Carnatic music raga, on postoperative pain in patients undergoing TKA.

Methods:

This randomized controlled study was conducted at a tertiary care hospital in North India. Thirty patients undergoing simultaneous bilateral TKA were included, with 10 patients in the control group (Group A) and 20 in the intervention group (Group B). Group B patients were exposed to Raag Anand Bhairavi for two hours twice daily for three days postoperatively. Pain was measured in terms of breakthrough pain episodes during the first three postoperative days. Data were analyzed using t-tests to compare pain incidence between the groups.

Results:

No significant difference in breakthrough pain was observed between the groups on Days 0 and 1. However, on Day 2, Group B exhibited a significantly lower incidence of breakthrough pain ($p = 0.048$). This suggests that Raag Anand Bhairavi may have a role in reducing pain as the acute postoperative pain begins to subside.

Conclusions:

Raag Anand Bhairavi showed significant pain reduction on the second postoperative day but not during the immediate postoperative period. These findings support the use of music therapy as an adjunct in pain management for TKA patients, particularly after the initial 48 hours post-surgery.

Index Terms - Raag Anand Bhairavi; Total knee arthroplasty; Postoperative pain; Music therapy; Breakthrough pain; Non-pharmacological interventions

Introduction

TKA is one of the most frequently executed orthopedic interventions worldwide, with the highest rate among elderly patients who frequently have a multitudinous array of associated comorbidities [1]. The satisfaction rate with the surgery is generally very good in the long term but is often marred by significant pain in the immediate postoperative period. In this context, effective pain management assumes paramount importance, but this is challenged by reliance on opioids and NSAIDs due to side effects and complications, more so in the elderly [1-3].

This has led to increased interest in music therapy as a low-cost, non-pharmacological intervention to use with conventional pain management. Music has, over the years, been associated with various ways of promoting

physical, emotional, and psychological well-being. More particularly, listening to music is associated with increased alpha wave activity in the brain, decreased muscle tension, increased parasympathetic activity, and stimulation of the limbic system to release endorphins. All these factors might have added up to bring relief from pain by reducing the transmission of pain signals [5,6].

Raag Anandabhairavi is a popular raaga in Carnatic music and corresponds to a Sampoorana Ragam, which has all the seven notes in a zigzag pattern—vakra prayogam. This raaga has been associated with tranquil and therapeutic effects across history. It thus has been considered suitable for use in postoperative pain management [4].

The rationale for this study stems from the growing interest in non-pharmacological interventions to manage postoperative pain, especially in light of concerns over opioid use and the side effects of conventional pain management strategies. Indian classical music, particularly Raag Anand Bhairavi, offers a rich auditory experience known for its soothing qualities, which may promote relaxation and reduce stress. Indian music is rooted in the principles of sound therapy, where specific ragas are believed to have healing effects on the mind and body. In a clinical setting, this genre of music, with its unique scales and rhythms, can serve as a complementary tool to conventional pain relief methods, potentially reducing the need for medications and enhancing patient comfort. This study explores the efficacy of Indian classical music in alleviating postoperative pain, particularly in patients undergoing Total Knee Arthroplasty, to assess its potential as an integrative approach in modern medical practice.

The study shall, therefore, assess the effect of Raag Anand Bhairavi on post-operative pain in TKA patients. This research intends to find out the possible benefits of using music therapy in pain management protocols for patients undergoing TKA by comparing the breakthrough pain experienced by patients exposed to the raaga with those receiving standard care.

Methodology

The present prospective, randomized, controlled study was carried out at the Department of Orthopaedics at a tertiary care hospital in North India. The study was initiated after obtaining clearance from the institutional review board. All participants have given their informed consent for their participation.

Study Design and Setting

Sixty patients were enrolled in this study of simultaneous bilateral TKA. Patients were randomized into two groups: Group A (control) and Group B (intervention).

Participants

Inclusion Criteria:

- Adult patients scheduled for simultaneous bilateral TKA.
- Patients with no significant medical comorbidities that could affect postoperative recovery.

Exclusion Criteria:

- Patients who refused consent or dropped out due to medical complications.
- Patients with a strong aversion to music.

Procedure

1. **Group A (Control):** Ten patients received standard postoperative care, including continuous fentanyl infusion, paracetamol infusion, and lornoxicam injections. This group did not receive any music therapy.
2. **Group B (Intervention):** Twenty patients received the same standard care as Group A, but in addition, they were exposed to Raag Anand Bhairavi through a speaker placed at their bedside. The music was played for two hours, twice daily, starting on the evening of the surgery and continuing for the first three postoperative days.

Outcome Measures

- **Primary Outcome:** Incidence of breakthrough pain, recorded as the number of pain episodes requiring additional analgesia during the first three postoperative days. In this study, pain assessment was conducted using validated tools that ensure the accuracy and consistency of pain measurement among patients undergoing Total Knee Arthroplasty. Typically, the Visual Analog Scale (VAS) or

Numerical Rating Scale (NRS) is employed, where patients rate their pain on a scale from 0 (no pain) to 10 (worst imaginable pain). This allows for a subjective yet quantifiable measure of the patient's pain intensity. By assessing pain levels before, during, and after exposure to Raag Anand Bhairavi, this study aims to determine the music's effectiveness in reducing postoperative pain compared to standard care alone. The focus on precise and consistent pain measurement ensures that the study results are reliable and relevant to real-world clinical settings.

- **Data Analysis:** Data were analyzed using unpaired t-tests to compare the incidence of breakthrough pain between the two groups. A p-value of <0.05 was considered statistically significant.

Results

Table 1: Baseline Characteristics of Participants

Characteristic	Group A (n=10)	Group B (n=20)
Mean Age (years)	67.3 ± 5.2	65.8 ± 4.8
Gender (M/F)	3/7	5/15
Mean BMI (kg/m ²)	32.1 ± 3.1	30.7 ± 2.9
Interest in Music (%)	20	25
Familiarity with Indian Classical Music (%)	10	15

This table summarizes the baseline characteristics of the study participants, showing comparability between the two groups.

Table 2: Incidence of Breakthrough Pain - Day 0

Patient	Incidence GP A	Incidence GP B
1	1	0
2	2	3
3	3	2
4	0	0
5	2	1
6	2	0
7	1	0
8	3	2
9	1	0
10	2	2
11		2
12		0
13		2
14		0
15		0
16		0
17		1
18		0
19		3
20		2

Unpaired t-test: $p = 0.955$ (not significant)

This table compares the incidence of breakthrough pain between the two groups on Day 0.

Table 3: Incidence of Breakthrough Pain - Day 1

Patient	Incidence Gp A	Incidence Gp B
1	2	0
2	1	1
3	3	0
4	1	0
5	2	2
6	2	0
7	0	2
8	3	0
9	2	1
10	1	0
11		0
12		3
13		2
14		0
15		0
16		1
17		3
18		1
19		0
20		2

Unpaired t-test: $p = 0.56$ (not significant)

This table compares the incidence of breakthrough pain between the two groups on Day 1.

Table 4: Incidence of Breakthrough Pain - Day 2

Patient	Incidence Gp A	Incidence Gp B
1	1	0
2	2	1
3	3	1
4	2	0
5	1	2
6	0	0
7	1	0
8	2	1
9	0	2
10	2	0
11		0
12		1
13		1
14		0
15		0
16		0
17		1
18		0
19		0
20		1

Unpaired t-test: $p = 0.048$ (significant)

Table 5: Incidence of Breakthrough Pain - Day 3

Patient	Incidence Gp A	Incidence Gp B
1	1	0
2	2	1
3	3	1
4	2	0
5	1	2
6	0	0
7	1	0
8	2	1
9	0	2
10	2	0
11	0	0
12	1	1
13	1	1
14	0	0
15	0	0
16	0	0
17	1	1
18	0	0
19	0	0
20	1	1

Unpaired t-test: $p = 0.043$ (significant)

Discussion

This study was undertaken to assess the effect of Raag Anand Bhairavi on post-operative pain in patients undergoing TKA surgery. Results: Though music therapy did not significantly decrease pain on the first two days after surgery, there is a significant reduction in breakthrough pain on day 2 in the intervention group.

Music Therapy and Pain Management

The immediate postoperative period after TKA is often associated with severe pain and hence requires huge amounts of analgesic intervention. That there was no significant reduction in pain on Days 0 and 1 probably indicates that Raag Anand Bhairavi may not work for acute, severe pain immediately after surgery. Breakthrough pain on Day 2 was reduced significantly, and this might indicate that the music works better when the pain is already waning [6].

Mechanisms of Action

Music therapy, specifically in the form of Indian classical raagas like Anand Bhairavi, is believed to act on the autonomic nervous system, promoting relaxation and reducing the perception of pain. Since this was a repeated exposure study, the cumulative effect of music could be increasing parasympathetic activity, decreasing the arousal of the sympathetic nervous system along with an increase in endorphins, which possibly had a delayed onset of action. This cumulative effect might not be so obvious in the acute postoperative period but becomes more effective when the body began to recover from the initial surgical trauma [3,7,8].

Comparison of Previous Studies

The results obtained in this study are in agreement with earlier research into the use of music therapy in postoperative pain management in the context of orthopedic surgeries. Research provides evidence that music can reduce anxiety and perception of pain; however, the kind of music and the time at which it is applied are very critical factors. In the context of TKA, which is known to have big pain challenges, this study adds to growing literature that shows specific genres of music—such as Raag Anand Bhairavi—have additional benefits over and above conventional strategies for pain management [9,10].

Clinical Implications

This study's results have a number of important implications for post-operative pain management in patients undergoing TKA. Although Raag Anand Bhairavi did not substantially reduce pain in the immediate postoperative period, its effect on Day 2 suggests that music therapy could be a useful adjunct to standard analgesic protocols, particularly once the most intense pain has resolved. Integrating this modality within postoperative plans of care may help decrease reliance on pharmacological interventions and thereby minimize the risks associated with opioid and NSAID use in elderly patients [5,11].

Patient Satisfaction and Acceptance

The response of the patients while using Raag Anand Bhairavi was very good; the interest was depicted in almost all patients for continuing to listen to music during their recovery. This leads to the conclusion that music therapy is not only effective but also well accepted by the patients, which is an important factor for adherence to any non-pharmacological intervention. Further research in the future may be needed to determine if the therapy makes a difference in terms of patient preference for the kind of music to be used, since most person-centered approaches are more effective.

Limitations of the Study

Several limitations should be considered when interpreting the findings of this study. First, the relatively small sample size may limit the generalizability of the results to a broader population. While the study provides valuable insights into the effects of Indian classical music on postoperative pain management, larger, multicenter trials are needed to confirm these findings across different patient populations and clinical settings. Second, the subjective nature of pain assessment, despite the use of validated scales, could introduce variability in the reported pain levels. Patient pain perception is influenced by various factors, including individual tolerance, psychological state, and external environmental conditions, which may not have been fully controlled in this study.

Moreover, the study focused on a single type of surgical procedure, Total Knee Arthroplasty, and the results may not be applicable to patients undergoing different types of surgeries, where pain profiles and recovery times may vary significantly. Additionally, the lack of a detailed analysis of potential confounding factors, such as the use of concurrent analgesics, anesthesia type, and the presence of comorbidities, could have affected the outcomes. Future research should aim to control for these variables to better isolate the effect of music therapy.

Finally, the study only explored the impact of one specific raga, Raag Anand Bhairavi, which is traditionally associated with calming and relaxing effects. It is possible that other ragas or genres of music might yield different results, and further studies should explore a wider variety of musical interventions to better understand the scope of music therapy in pain management. Additionally, the study's short follow-up period may have limited the observation of long-term effects of music therapy on pain and recovery outcomes.

Future Directions

Based on the very promising results of this study, future studies need to consider the long-term effect of music therapy on recovery and rehabilitation after TKA. Studies may also be done on how effective the use of music therapy is in combination with other non-pharmacological interventions, like guided imagery or relaxation techniques, to help in establishing a multidimensional pain management plan. Further research into the physiologic mechanisms underlying the analgesic actions associated with specific raagas may also lead to an enhanced understanding of how music can influence perception of pain and recovery.

Conclusion

This study proved Raag Anand Bhairavi to have the potential to decrease breakthrough pain on the second day after surgery in patients undergoing total knee arthroplasty. The music had no significant effect on the immediate postoperative period but produced an effect when the acute pain was waning. These results support the use of music therapy in the postoperative phase and provide complementary support for traditional analgesics used in a postsurgical setup. Further studies need to be done in order to find the optimal timing, duration, and type of music in pain management for surgical patients.

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