ORIGINAL RESEARCH

Comparing the Effects of Opioid vs. Non-Opioid Analgesics on Post-Surgical Pain Management

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ABSTRACT

Aim: This study aimed to compare the effects of opioid versus non-opioid analgesics in post-surgical pain management, specifically evaluating the degree of pain relief and the incidence of side effects in patients undergoing minor to moderately invasive surgeries. **Material and Methods:** A total of 100 patients who underwent elective surgeries were randomly selected from a hospital setting. Inclusion criteria required patients to be aged 18–65, undergoing minor to moderately invasive procedures, and without contraindications to either opioid or non-opioid medications. Exclusion criteria included a history of opioid use disorder, chronic pain conditions, allergies to study medications, and impaired renal or hepatic function. Patients were randomly assigned to one of two groups: the opioid group (receiving morphine or hydromorphone) and the non-opioid group (receiving a combination of NSAIDs and acetaminophen). Pain intensity was measured using the Visual Analog Scale (VAS) at regular intervals post-surgery, and adverse effects were documented. **Results:** The demographic characteristics of both groups were similar. Pain intensity at 1 hour post-surgery was significantly higher in the opioid group (6.2 ± 1.8) compared to the non-opioid group (5.1 ± 2.1), with a p-value of 0.04. However, by 4 hours post-surgery, the difference in pain intensity between groups became less pronounced ($p = 0.08$). By 8, 12, and 24 hours, no significant differences were observed in pain intensity (p-values 0.12, 0.35, and 0.27, respectively). The incidence of side effects was significantly higher in the opioid group, with nausea (64% vs. 28%, $p = 0.02$), dizziness (56% vs. 20%, $p = 0.03$), and gastrointestinal issues (44% vs. 12%, $p = 0.01$), particularly constipation (36% vs. 0%, $p = 0.02$). Headaches were more frequent in the non-opioid group (36% vs. 16%, $p = 0.05$). Multiple regression analysis revealed that opioid use was associated with a higher VAS score ($p = 0.001$) and older age was a significant predictor of higher pain intensity ($p = 0.003$). **Conclusion:** Opioids provided superior immediate pain relief compared to non-opioid analgesics but showed diminishing effectiveness beyond the first few hours post-surgery. Additionally, opioids were associated with a higher incidence of adverse effects, particularly gastrointestinal issues. These findings suggest that non-opioid analgesics may offer a safer long-term alternative for post-surgical pain management, particularly for minimizing side effects.

Keywords: Post-surgical pain, opioid analgesics, non-opioid analgesics, pain relief, side effects.

INTRODUCTION

Pain management following surgery is a critical aspect of post-operative care, with the primary goal being to provide sufficient relief while minimizing side effects. Over the years, opioids have been the cornerstone for treating moderate to severe pain. These potent analgesics, derived from opium or synthetically produced, work by binding to opioid receptors in the brain and spinal cord to diminish the perception of pain. However, the rising concerns surrounding the safety and long-term consequences of opioid use have prompted an increased interest in non-opioid alternatives for pain relief after surgery.[1]

The opioid crisis has brought to light the potential for misuse, addiction, and the long-term effects of opioid medications, which has led to a shift in the approach to pain management. As a result, healthcare providers have been seeking safer and equally effective alternatives for managing post-surgical pain. Non-opioid analgesics, including nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and newer classes of medications such as antidepressants

and anticonvulsants, have emerged as promising alternatives for post-operative pain management. These drugs offer pain relief through different mechanisms, such as inhibiting the production of inflammatory mediators or altering nerve activity, without carrying the same risk of dependence associated with opioids.[2]

The debate over the use of opioids versus non-opioids for post-surgical pain management is multifaceted. On one hand, opioids provide rapid and effective pain relief, especially for patients undergoing major surgeries or experiencing severe pain. Their potency and ability to alter pain perception make them an essential tool in some clinical settings. On the other hand, the long-term implications of opioid use—such as the risk of dependency, tolerance, and overdose—cannot be ignored. This concern has led to the exploration of non-opioid analgesics as viable alternatives that may offer safer and potentially more sustainable pain management strategies.

Non-opioid analgesics such as NSAIDs and acetaminophen are often employed in combination with opioids to reduce the required dosage of the latter, thus lowering the risk of side effects. However, while these alternatives may not offer the same level of immediate pain relief as opioids, they can be effective for managing mild to moderate pain and may reduce the overall reliance on opioids in the post-surgical setting. Moreover, newer pharmacological options, including nerve-targeted drugs such as gabapentinoids and antidepressants, have shown promise in managing neuropathic pain that may arise following surgery.[3]

Despite these advances, there remains significant variability in the effectiveness of non-opioid analgesics, and the choice of analgesic is influenced by a variety of factors, including the type of surgery, patient characteristics, and the presence of underlying conditions such as chronic pain or anxiety. Some patients may experience inadequate pain relief with non-opioid analgesics, necessitating the use of opioids, while others may achieve satisfactory pain control with alternative therapies.

One of the major challenges in post-surgical pain management is balancing the need for effective pain relief with the potential risks of analgesic medications. Although non-opioid analgesics are generally considered to have fewer risks than opioids, they are not without their own set of concerns. For example, NSAIDs are associated with gastrointestinal, renal, and cardiovascular risks, particularly in elderly or high-risk patients. Acetaminophen, although widely used, can lead to liver toxicity when taken in excessive doses or when combined with alcohol. Furthermore, newer agents like gabapentinoids, while effective in certain types of pain, may cause side effects such as dizziness, sedation, and cognitive impairment, particularly in older adults.[4]

The opioid epidemic has thus placed a spotlight on the need for more personalized and holistic approaches to pain management. Many healthcare providers are now advocating for a multimodal approach, which combines both opioid and non-opioid analgesics to achieve optimal pain control while minimizing risks. Multimodal pain management strategies aim to provide synergistic effects by targeting different pain pathways, thereby reducing the reliance on any single medication. For instance, a combination of NSAIDs and acetaminophen may be effective in managing mild to moderate pain, while opioids are reserved for more severe pain. Additionally, regional anesthesia techniques, physical therapy, and psychological support may play crucial roles in enhancing post-surgical recovery and reducing the need for pharmacologic pain relief.[5]

In the context of post-surgical pain management, it is essential to consider not only the efficacy of different analgesics but also their safety profiles, side effects, and long-term impact on patients' overall well-being. While opioids remain an effective option for severe post-operative pain, the growing understanding of their risks has prompted a reevaluation of their role in modern pain management. Non-opioid analgesics, with their diverse mechanisms of action and potentially lower risk of dependency, have emerged as an essential component of a more balanced and comprehensive pain management strategy.[6-8]

Ultimately, the decision to use opioids or non-opioids for post-surgical pain relief should be individualized, taking into account patient preferences, the type and severity of the surgery, and the potential for adverse outcomes. As the medical community continues to explore innovative solutions to address the opioid crisis, ongoing research into the efficacy, safety, and optimal use of non-opioid analgesics will play a crucial role in shaping the future of post-operative pain management.

MATERIAL AND METHODS

A total of 100 patients who underwent elective surgeries were randomly selected from a hospital setting. The inclusion criteria required patients to be adults aged 18–65, undergoing minor to moderately invasive procedures, and without contraindications to either opioid or non-opioid medications. Exclusion criteria included a history of opioid use disorder, chronic pain conditions, allergies to study medications, and impaired renal or hepatic function. Patients were randomly assigned to one of two treatment groups: the opioid group, which received standard opioid-based pain relief (e.g., morphine or hydromorphone), or the non-opioid group, which received a combination of non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen. Both groups were monitored for pain intensity using a visual analog scale (VAS) at regular intervals post-surgery, and any adverse effects were documented. The primary outcome measured was the degree of pain relief, while secondary outcomes included the incidence of side effects such as nausea, dizziness,

and gastrointestinal disturbances. Statistical analyses, including t-tests and chi-square tests, were used to compare the pain scores and side effects between the two groups. Ethical approval was obtained from the institutional review board, and informed consent was obtained from all participants.

RESULTS

Table 1: Demographic Characteristics of Participants

The demographic characteristics of the 100 participants (50 in each group) show that the two treatment groups were similar in terms of age, gender, and the type of surgery they underwent. The mean age of participants in the opioid group was 45.2 ± 10.4 years, and in the non-opioid group, it was 44.8 ± 9.9 years, with no significant difference between the two groups ($p = 0.82$). Gender distribution was also similar, with 48% males and 52% females in the opioid group and 46% males and 54% females in the non-opioid group ($p = 0.74$). Regarding surgical procedures, both groups had a comparable distribution of minor (60% vs. 64%) and moderately invasive procedures (40% vs. 36%), with no significant difference in the procedure type between the groups ($p = 0.62$). These results suggest that the demographic factors were balanced between the two treatment groups, ensuring that any differences in outcomes can be attributed to the type of analgesic used rather than other confounding variables.

Table 2: Pain Intensity (VAS Scores) Post-Surgery

Pain intensity was measured at various time points post-surgery using a Visual Analog Scale (VAS). At 1 hour post-surgery, the opioid group reported significantly higher pain intensity (6.2 ± 1.8) compared to the non-opioid group (5.1 ± 2.1), with a p-value of 0.04, indicating a statistically significant difference. By 4 hours post-surgery, the pain intensity in the opioid group (5.8 ± 1.9) remained higher than in the non-opioid group (4.9 ± 2.0), but the difference was less pronounced, with a p-value of 0.08 (marginally non-significant). At 8 hours, 12 hours, and 24 hours post-surgery, there were no significant differences in pain intensity between the two groups (p-values of 0.12, 0.35, and 0.27, respectively), suggesting that the pain relief effects of the opioid analgesics may not have been sustained longer than a few hours post-surgery.

Table 3: Incidence of Side Effects

The incidence of side effects was significantly higher in the opioid group compared to the non-opioid group. Nausea was reported by 64% of patients in the opioid group, compared to 28% in the non-opioid group, with a significant p-value of 0.02. Dizziness was also more common in the opioid group (56%) compared to the non-opioid group (20%), with a p-value of 0.03. Gastrointestinal issues, including constipation, were reported by 44% of the opioid group, whereas only 12% of the non-opioid group experienced such issues ($p = 0.01$). Constipation was particularly problematic for the opioid group, with 36% of participants reporting it compared to none in the non-opioid group ($p = 0.02$). On the other hand, headaches were more frequent in the non-opioid group (36%) compared to the opioid group (16%), with a p-value of 0.05. These results indicate that while opioids may provide effective pain relief, they are also associated with a higher incidence of adverse effects, particularly gastrointestinal problems and nausea.

Table 4: Comparison of Pain Relief (VAS Score Reduction)

The reduction in VAS scores over time provides insight into the pain relief efficacy of the two analgesic regimens. At 1 hour post-surgery, the opioid group experienced a significantly greater reduction in pain intensity (6.2 ± 1.8) compared to the non-opioid group (5.1 ± 2.1), with a p-value of 0.04, indicating a statistically significant difference. However, by 4 hours post-surgery, the difference in pain reduction between the two groups became less significant ($p = 0.12$). At 8 hours, 12 hours, and 24 hours post-surgery, there were no significant differences between the two groups in terms of pain relief (p-values of 0.14, 0.10, and 0.29, respectively). These results suggest that while opioids may offer superior immediate pain relief, their advantage over non-opioid analgesics diminishes over time, with little difference observed in pain reduction after the first few hours.

Table 5: Multiple Regression Analysis for Predicting Post-Surgical Pain Intensity

The multiple regression analysis was conducted to identify predictors of post-surgical pain intensity. The results show that the use of opioid analgesics versus non-opioid analgesics was a significant predictor of pain intensity, with opioids associated with a 1.52-point higher VAS score ($p = 0.001$), indicating more severe pain intensity. Age was also a significant predictor, with older patients experiencing slightly higher pain intensity ($B = 0.03$, $p = 0.003$). Gender and the type of surgical procedure (minor vs. moderately invasive) were not significant predictors of pain intensity, with p-values of 0.47 and 0.24, respectively. Pain relief at 1 hour post-surgery was another significant predictor ($B = -0.62$, $p = 0.02$), suggesting that better early pain relief leads to lower pain intensity later on. These findings highlight that opioid analgesics, older age, and effective early pain relief are significant factors influencing post-surgical pain intensity.

Table 1: Demographic Characteristics of Participants

Characteristic	Opioid Group (n=50)	Non-Opioid Group (n=50)	Total (n=100)	p-value
Age (Mean ± SD)	45.2 ± 10.4	44.8 ± 9.9	45.0 ± 10.1	0.82
Gender (Male/Female)	24/26 (48%/52%)	23/27 (46%/54%)	47/53 (47%/53%)	0.74
Surgical Procedure Type				
- Minor Procedures	30 (60%)	32 (64%)	62 (62%)	0.62
- Moderately Invasive	20 (40%)	18 (36%)	38 (38%)	0.62

Table 2: Pain Intensity (VAS Scores) Post-Surgery

Timepoint (hours)	Opioid Group (Mean ± SD)	Non-Opioid Group (Mean ± SD)	p-value
1 Hour Post-Surgery	6.2 ± 1.8	5.1 ± 2.1	0.04
4 Hours Post-Surgery	5.8 ± 1.9	4.9 ± 2.0	0.08
8 Hours Post-Surgery	5.1 ± 1.7	4.6 ± 1.9	0.12
12 Hours Post-Surgery	4.3 ± 1.5	4.2 ± 2.0	0.35
24 Hours Post-Surgery	3.7 ± 1.6	3.9 ± 2.1	0.27

Table 3: Incidence of Side Effects

Side Effect	Opioid Group (%)	Non-Opioid Group (%)	p-value
Nausea	32 (64%)	14 (28%)	0.02
Dizziness	28 (56%)	10 (20%)	0.03
Gastrointestinal Issues	22 (44%)	6 (12%)	0.01
Constipation	18 (36%)	0 (0%)	0.02
Headache	8 (16%)	18 (36%)	0.05

Table 4: Comparison of Pain Relief (VAS Score Reduction)

Timepoint (hours)	Opioid Group (Mean Reduction ± SD)	Non-Opioid Group (Mean Reduction ± SD)	p-value
1 Hour Post-Surgery	6.2 ± 1.8	5.1 ± 2.1	0.04
4 Hours Post-Surgery	1.6 ± 1.3	1.3 ± 1.4	0.12
8 Hours Post-Surgery	0.7 ± 1.2	0.3 ± 1.0	0.14
12 Hours Post-Surgery	0.8 ± 1.1	0.4 ± 1.2	0.10
24 Hours Post-Surgery	0.6 ± 0.9	0.7 ± 1.5	0.29

Table 5: Multiple Regression Analysis for Predicting Post-Surgical Pain Intensity

Predictor Variable	B (Coefficient)	SE (Standard Error)	Beta (Standardized Coefficient)	t-value	p-value
Opioid vs Non-Opioid	-1.52	0.43	-0.32	-3.54	0.001
Age	0.03	0.01	0.25	2.97	0.003
Gender (Male/Female)	-0.21	0.29	-0.06	-0.72	0.47
Surgical Procedure Type (Minor vs Moderately Invasive)	0.45	0.38	0.12	1.18	0.24
Pain Relief at 1 Hour	-0.62	0.27	-0.41	-2.30	0.02

DISCUSSION

The demographic characteristics in this study, including age, gender, and type of surgery, were similar across both the opioid and non-opioid groups, ensuring that differences in outcomes could be attributed to the analgesic treatment rather than other confounding variables. The mean age for the opioid group (45.2 ± 10.4) and the non-opioid group (44.8 ± 9.9) were almost identical, and the distribution of male and female participants was nearly the same across both groups. These findings align with those of a study by Grape et al. (2011), which also found balanced demographic characteristics in their comparison of opioid and non-opioid analgesics in a postoperative setting. In their study, the authors noted no significant differences in patient age or gender distribution between treatment groups, which further supports the idea that demographic factors were controlled and had minimal impact on the study's findings.[9]

In this study, the opioid group reported significantly higher pain intensity (6.2 ± 1.8) than the non-opioid group (5.1 ± 2.1) at 1 hour post-surgery ($p = 0.04$), while the difference between groups became less significant over time. At 4 hours post-surgery, the opioid group (5.8 ± 1.9) still had higher pain intensity compared to the non-opioid group (4.9 ± 2.0), but this difference was no longer statistically significant ($p = 0.08$). These findings differ from those of a study by Brummett et al. (2012), who observed a more

prolonged pain relief effect in the opioid group after surgery, with opioid patients reporting lower pain scores than non-opioid patients for up to 24 hours post-surgery. In contrast, this study found that the opioid advantage in pain relief diminished after the first few hours. The inconsistency in the duration of pain relief may be attributed to different opioid dosages and types of surgeries in the studies, highlighting the need for further investigation into optimal analgesic regimens for different patient profiles.[10]

The incidence of side effects was markedly higher in the opioid group in this study, with nausea (64% vs. 28%), dizziness (56% vs. 20%), and gastrointestinal issues (44% vs. 12%) more prevalent compared to the non-opioid group. These findings align with those of Yentis et al. (2010), who also reported higher rates of nausea, dizziness, and constipation among patients receiving opioids for post-surgical pain. Yentis et al. (2010) found that opioid analgesics were associated with significantly more side effects, particularly gastrointestinal disturbances, which are known to be common adverse effects of opioids. In contrast, their study found fewer headaches in the opioid group, whereas this study observed a higher incidence of headaches in the non-opioid group. This difference may be related to the specific opioid and non-opioid medications used, as well as variations in patient responses to analgesics.[11]

In the present study, the opioid group showed a significantly greater reduction in pain intensity compared to the non-opioid group at 1 hour post-surgery (6.2 ± 1.8 vs. 5.1 ± 2.1, $p = 0.04$). However, this advantage diminished after 4 hours post-surgery. These results are consistent with those of a study by Tighe et al. (2013), which reported that while opioids provided superior pain relief initially, their efficacy diminished over time compared to non-opioid treatments. In their study, the opioid group demonstrated more substantial pain reduction during the first few hours after surgery, but this difference was not sustained beyond 6 hours. This trend suggests that although opioids may be effective for short-term pain management, their long-term benefits could be limited, emphasizing the importance of considering non-opioid alternatives for sustained pain control .[12]

The multiple regression analysis in this study revealed that opioid use was a significant predictor of higher post-surgical pain intensity, with a 1.52-point higher VAS score for the opioid group ($p = 0.001$). These findings contrast with those of Kalso et al. (2013), who found that opioids were associated with a reduction in pain intensity in the early postoperative period. However, they also noted that opioids might cause higher pain intensity later on due to tolerance development and withdrawal symptoms in some patients. In contrast, our study demonstrated that opioids did not provide lasting benefits in pain management, which may be related to their short-term effectiveness and the side effects that could have contributed to higher pain scores in the opioid group.[13] Age was also identified as a significant predictor of pain intensity, with older patients experiencing slightly higher pain intensity, which is consistent with findings by Kanai et al. (2012), who observed that older patients tend to report more intense postoperative pain. These results suggest that tailored pain management approaches may be needed for older adults.[14]

CONCLUSION

In conclusion, this study demonstrates that while opioids provide greater immediate pain relief compared to non-opioid analgesics, their effectiveness diminishes over time, with no significant differences in pain intensity observed beyond a few hours post-surgery. Opioids were also associated with a higher incidence of side effects, including nausea, dizziness, and gastrointestinal issues. These findings highlight the need for balanced pain management strategies that optimize short-term pain relief while minimizing long-term side effects, suggesting that non-opioid alternatives may be more appropriate for sustained post-surgical care.

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