Original Article

Comparison Between Non-Opioid Versus Opioid Analgesia in Neuro-Surgery

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ABSTRACT

Objective: To compare effect of opioids and non-opioids pain management protocol in patients underwent neurosurgical procedure.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Anesthesia department of Lady Reading Hospital, Peshawar, from January 2023 to June 2023.

Methods: A total of 200 patients were enrolled in study and divided into two groups 112 in opioid group and 88 in non-opioid group by simple randomization method. In opioid group patient were given oral hydrocodone and intravenous morphine. In non-opioid group patient s were given NSAIDs. Preoperative variables, including body mass index, age of patients, gender, history of prior surgeries and opioid use and the any medical comorbidities such as hypertension, diabetes mellitus, anxiety and depression. Postoperative data comprised postoperative hemorrhage/bleeding, postoperative pain scores and length of stay.

Results: Morphine equivalent units opioid group was greater than the non opioids group at 6, 12 and 24 hours, ($p<0.001$). According to primary outcomes, the pain at 6, 12 and 24 hours in opioid patients was 4.04±0.42, 3.65±0.22 and 3.63±0.30, respectively. The pain at 6, 12 and 24 hours in non opioid patients was 3.13±0.55, 3.11±0.18 and 2.63±0.28, respectively.

Conclusion: Non-opioid medications were found to significantly reduce pain compared to opioids, and there were no observed increases in hemorrhagic complications in the non-opioid group. Non-opioid medications may be a viable alternative for managing postoperative pain in neurosurgery patients, potentially with fewer associated complications.

Key Words: Neurosurgery, Pain management, Opioids, Non opioids, Pain score, Post-operative hemorrhage

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INTRODUCTION

Managing post-operative pain after cranial surgery presents a unique challenge, primarily due to the delicate nature of the surgical site and the need for accurate neurological assessments[1]. While opioids have traditionally been the go-to choice for pain management, there is a growing awareness of their limitations and the potential risks associated with their use, such as sedation[2]. A multimodal approach combines various analgesic techniques to reduce the reliance on opioids.

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Intravenous (IV) morphine or hydromorphone are potent opioid analgesics that can be administered as needed or via patient-controlled analgesia (PCA) devices[3]. PCA allows patients to self-administer a predetermined dose of medication, which can be helpful in tailoring pain relief to individual needs[4].

This approach can include non-opioid medications such as non-steroidal anti-inflammatory, acetaminophen, muscle relaxants, and anticonvulsants[5]. These drugs can be used in combination to provide effective pain relief while minimizing opioid use. Depending on the nature of the cranial surgery, regional anesthesia techniques, such as scalp blocks or local anesthetics, may be employed to target specific pain pathways. These techniques can reduce the need for systemic opioids[6].

Pain management following neurosurgical procedures is a critical aspect of postoperative care. The statistics show 69% and 48% of patients reporting significant uncontrolled pain during the 1st and 2nd days after surgery, respectively, suggest that pain management in this context may not be optimal[7]. Inadequate pain control can lead to patient discomfort and potentially hinder their recovery. Several factors can contribute to

postoperative pain, including the type of cranial procedure, individual patient factors, and the analgesic regimen used[8]. However, combining NSAIDs and opioids can make it challenging to attribute the efficacy of NSAIDs alone in managing postoperative pain. This is because the combination may mask the individual contributions of each medication. It's often used in clinical practice to achieve a balanced pain management strategy that takes advantage of the benefits of both classes of drugs[9].

METHODS

This randomized clinical trial conducted at Anesthesia department of Lady Reading Hospital, Peshawar, from January 2023 to June 2023 in duration of six months after written consent from patients and permission from hospital ethical board. The assessment was conducted using the Defense and Veterans Pain Rating Scale (DVPRS) at 6th hour, 12th hour, and 24th hour after surgery.

Individuals with allergies to non-steroidal anti-inflammatory drugs (NSAIDs), patients who have reached the final stage of kidney failure, individuals with chronic kidney disease and a baseline serum creatinine level higher than 1.5 mg/dL were excluded from the study. Opioid analgesics were hydrocodone and intravenous morphine Preoperative variables, including body mass index, age of patients, gender, history of prior surgeries and opioid use and the any medical comorbidities such as hypertension, diabetes mellitus, anxiety and depression were examined, while operative data involved the type and length of surgery, with all procedures involving cranial access, dura opening, and surgery within the brain parenchyma. Postoperative data comprised postoperative hemorrhage/bleeding, postoperative pain scores (DVPRS) at 6th, 12th, and 24th hour and length of stay. The DVPRS pain scores, ranging from 0 to 10, are assessed hourly by nursing staff and are re-evaluated before and after the administration of medications. Additionally, CT scan and MRI was used to assess postoperative bleeding. Educational meetings were conducted with surgical team including ancillary staff, nursing, pharmacy professionals, and intensive care providers to ensure mutual collaboration. Availability of all study medicines was assured. Patients received preoperative counseling regarding what to expect in terms of pain after surgery. Education was provided on the use of non-steroidal anti-inflammatory drugs (NSAIDs) and acetaminophen as the first-line treatments for pain.

Continuous variables were assessed using Student t-tests, while categorical variables were compared using the chi-square. Mean pain scores between opioid (OP) and non-opioid groups were compared using an independent t-test, with a 95% confidence interval to determine non inferiority, employing a margin of 1 point on the DVPRS. All statistical analyses were conducted using SPSS, version 26.0 (IBM, Armonk, NY), and a significance level of $P < 0.05$ was considered.

RESULTS

Three hundred patients were included, in this study. There were 212 (70.7%) patients treated with opioid and 88 (29.3%) patients treated with opioid-sparing protocol (OSP). The mean age, BMI and procedure time of opioid was 62.13±5.79 years, 27.83±2.34 kg/m^2 and 3.95±1.28 hours, respectively. Diabetes was observed in 46 (21.7%) patients. Whereas, hypertension was noted in 57 (26.9%) patients. There were 46 (21.7%) in depression and 33 (15.6%) patients in anxiety. Craniotomywas observed in 55 (25.9%) patients and preoperative opioid was used in 48 (22.6%) patients. The mean age, BMI and procedure time of non-opioids was 64.82±6.14 years, 28.18±2.38 kg/m^2 and 4.18±1.26 hours, respectively. Diabetes was observed in 20 (22.7%) patients. Whereas, hypertension was noted in 26 (29.5%) patients. There were 24 (27.3%) in depression and 17 (19.3%) patients in anxiety. Craniotomywas observed in 18 (20.5%) patients and preoperative opioid was used in 16 (18.2%) patients. The differences of demographic and baseline characteristics among both the groups were almost equal, ($p>0.050$). (Table. 1).

The distribution of pain score of non-opioids and opioid groups were shown in figure. I. The pain score was high in opioid group as compare to the non-opioid group at 6, 12 and 24 hours, ($p<0.001$). Morphine equivalent units opioid group was greater than the non-opioids group at 6, 12 and 24 hours, ($p<0.001$). (Figure. 2).

Table No. 1: Demographic and baseline characteristics of the study groups

Characteristic	Opioid 212 (70.7%)	Non-Opioid 88 (29.3%)	p-value
Age (years)	62.13±5.79	64.82±6.14	0.024
Sex			
Male	149 (70.3)	63 (71.6)	0.821
Female	63 (29.7)	25 (28.4)	
BMI	27.83±2.34	28.18±2.38	0.029
Procedure time (hour)	3.95±1.28	4.18±1.26	0.188
Diabetes status	46 (21.7)	20 (22.7)	0.845
Hypertension	57 (26.9)	26 (29.5)	0.639
Depression	46 (21.7)	24 (27.3)	0.299
Anxiety	33 (15.6)	17 (19.3)	0.427
Craniotomy	55 (25.9)	18 (20.5)	0.313
Opioid used (preoperative)	48 (22.6)	16 (18.2)	0.391

Table No. 2: Primary and secondary outcomes of the study groups

Outcome	Opioid	Non-Opioid	p-value
Primary outcome			
6 hours pain	4.04±0.42	3.13±0.55	<0.001
12 hours pain	3.65±0.22	3.11±0.18	<0.001
24 hours pain	3.63±0.30	2.63±0.28	<0.001
Postoperative hemorrhage	24 (11.3)	3 (3.4)	0.029
Secondary outcome			
LOS (days)	3.12±1.31	2.98±1.18	<0.001

According to primary outcomes, the pain at 6, 12 and 24 hours in opioid patients was 4.04±0.42, 3.65±0.22 and 3.63±0.30, respectively. The pain at 6, 12 and 24 hours in non-opioid patients was 3.13±0.55, 3.11±0.18 and 2.63±0.28, respectively. Whereas, the mean length of stay in hospital of opioid patients was greater than the non-opioid patients, 3.12±1.31 days and 2.98±1.18 days, respectively, (p<0.001). (Table 2).

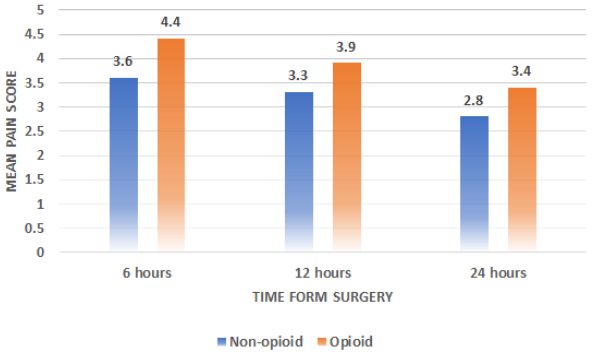

Figure No. 1: Pain score among the groups

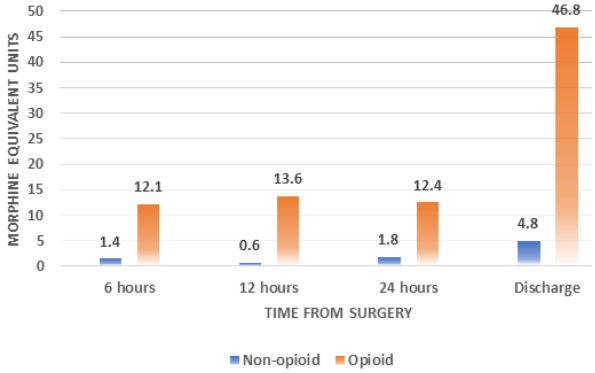

Figure No. 2: MEU among the groups.

DISCUSSION

After low risk surgeries more than 80% of patients receive opioids postoperatively. This statistic underscores the common practice of using opioids to manage pain following surgical procedures[10]. Many patients who are discharged from hospitals after surgery leave with opioid prescriptions. This implies that the use of opioids for pain management extends beyond the hospital setting and continues into the postoperative recovery period[11].

In this trial pain score was high in opioid group as compare to the non-opioid group at 6, 12 and 24 hours, (p<0.001). Morphine equivalent units opioid group was greater than the non opioids group at 6, 12 and 24 hours, (p<0.001). A study by Moore et al[12] reported that opioids are not necessarily superior to non-opioid drugs, such as NSAIDs (Nonsteroidal Anti-Inflammatory Drugs), acetaminophen, or combinations of these drugs, in managing acute or postoperative pain.

A study was conducted by Kaafaraniet al[13] indicates that 95% of patients undergoing surgery in the USA were prescribed opioids after discharge. In contrast, only 5% of patients in the mentioned European and Asian countries received opioid prescriptions in a similar post-surgery context. In a study Shay et al[14] concluded that opioids are powerful analgesic medications commonly used to manage moderate-to-severe pain, but their side effects and potential impact on postoperative outcomes have been a subject of discussion and concern.

In this study postoperative hemorrhage was occurred in 11.3% of patients in opiod group and 3.4% in non opiods group. In a meta-analysis Gobble et al[15] did not find a significant increase in postoperative bleeding when ketorolac was compared with control groups. It was also observed that ketorolac is effective in managing postoperative pain, and its effectiveness is comparable to opioids. Another study by Cassinelli et al[16] reported that patients who were randomized to receive non-opioid medications immediately after surgery and at specific time points (4, 12, and 16 hours postoperative) had significantly lower Visual Analog Pain Scores compared to another group that presumably did not receive non-opioid medications.

Incidence of anxiety was 15.6% in opiod group and 19.3% in non opiods group. Conselling of patients about procedure and post-operative pain management was key component of our study which is proved by previous literature. Studies conducted by Sheldon et al[17] reported significant portion of individuals 68% did not use all of the prescribed opioids, and a high percentage 81% reported excellent or good pain control during their postoperative recovery with NSAIDS. Sjoling et al[18] reported that adequate preoperative counseling may contribute to lower postoperative pain and anxiety levels. When patients have realistic expectations about postoperative pain and are prepared for it, they may experience less anxiety.

Another study by Ahmad et al[19] in 2021 reported that opioid-sparing cohort had lower pain scores at different time points after surgery compared to the control group. Specifically, the pain scores were lower at 6 hours (3.45 vs 4.19, P = 0.036), 12 hours (3.21 vs 4.00, P = 0.006), and 24 hours (2.90 vs 3.59, P = 0.010). This suggests that the opioid-sparing pain management protocol

provided better pain control in the first 24 hours post-surgery.

CONCLUSION

Non-opioid medications were found to significantly reduce pain compared to opioids, and there were no observed increases in hemorrhagic complications in the non-opioid group. Non-opioid medications may be a viable alternative for managing postoperative pain in neurosurgery patients, potentially with fewer associated complications.

Limitations: The study may not account for other interventions or medications that patients receive concurrently. This could confound the results and make it difficult to attribute observed effects solely to the non-opioid or opioid analgesia.

Author's Contribution:

Concept & Design of Study:	Jawad Hameed
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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