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"NAVIGATING POSTOPERATIVE PAIN: THE EFFECTIVENESS OF PREEMPTIVE AND PREVENTIVE ANALGESIA"

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ABSTRACT

Background: This study aimed to compare the efficacy of pre-emptive versus preventive analgesia on the postoperative need for rescue analgesics in surgical patients over 24 hours, along with monitoring hemodynamic changes.

Design: A prospective randomized study involving 60 patients aged 18-65, classified as ASA grade I and II, undergoing surgeries lasting up to 2 hours under general anesthesia.

Methods: Patients were divided into two groups:Group I (Preemptive): Received 1 gm of IV Paracetamol before skin incision and IV normal saline at the end of surgery.Group II (Preventive): Received IV normal saline before incision and IV Paracetamol before closure.

Results:In our study, there was a significant reduction in pain (VAS SCORE <3) from 15min equally in both groups and the first rescue analgesia was given after 4 hours in group 1 compared to 15minutes in group 2.

Conclusion: Preemptive analgesia may provide better perioperative analgesia and stability while reducing postoperative analgesic needs, whereas preventive analgesia is effective in the immediate postoperative period.

Keywords:Preemptive analgesia,Postoperative pain,Rescue analgesic,Haemodynamic.

INTRODUCTION

Postoperative pain is a significant issue that negatively impacts patient satisfaction, recovery, mobility, and early hospital discharge. Effective pain management is essential for the comfort and well-being of surgical patients. The concept of preemptive analgesia aims to reduce the intensity and duration of postoperative pain by addressing the central components of pain hypersensitivity that follow injury. [1]Experimental studies have shown that antinociceptive treatments administered before an injury [2]are more effective at minimizing central sensitization compared to treatments given afterward.

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Despite early clinical studies yielding mixed results regarding the benefits of preemptive analgesia, the belief in its potential advantages has persisted, leading to ongoing research and application in clinical practice.[3-5]

Preemptive Analgesia: This approach involves administering analgesics before the onset of nociceptive stimuli, which helps prevent peripheral and central sensitization. By doing so, it reduces immediate postoperative pain and may lower the risk of developing chronic pain.

Preventive Analgesia: This involves administering pain relief at any point during the perioperative period, particularly after surgical incision, to inhibit central sensitization and hyperexcitability. It is particularly effective in patients with no history of preoperative pain.

Both strategies aim to enhance pain control and improve patient outcomes after surgery.

Understanding the pain pathway and the concept of central sensitization is crucial for grasping the principles of preemptive and preventive analgesia. Acute pain, such as that caused by surgical stress or harmful stimuli, can lead to long-term emotional and psychological distress. If not adequately managed, this acute pain has the potential to develop into chronic pain, which is significantly more challenging to endure and treat.[6]

Recent research has expanded the understanding of factors contributing to central sensitization[7-8] beyond surgical incision alone. Factors such as chronic or acute preoperative pain, intraoperative stimuli (like tissue retraction and organ manipulation), and postoperative inflammatory processes can intensify pain perception, leading to long-term hyperalgesia and allodynia.

Currently, various multimodal techniques are being investigated to manage pain during the perioperative period. Preemptive analgesia is viewed as advantageous because it integrates multiple strategies aimed at reducing postoperative pain and minimizing the need for rescue analgesics, particularly opioids. This approach supports early recovery and mobility, aligning with Enhanced Recovery After Surgery (ERAS) protocols for surgical patients.

Several pre-emptive analgesic regimens have been mentioned in literature. These include●Pharmacotherapy in the form of -intravenous doses of opioids,[9-10]non-steroidal anti-inflammatory drugs as well as NMDA receptor antagonists ●Local anaesthetic infiltration at surgical incision[11-12]●Regional nerve blocks[13]●Use of opioids as Epidural analgesia[14]

Multimodal analgesic regimens[15], which involve combining two or more pain management methods, have gained importance, particularly in the context of Enhanced Recovery After Surgery (ERAS) programs, emphasizing the need for effective postoperative pain control.

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However, data from various clinical studies reveal inconsistent support for the effectiveness of these approaches.[16]

Postoperative pain relief is crucial for patient care, with the initial concept linking tissue damage from surgery to postoperative pain introduced by Woolf[17]. Research into preemptive and preventive analgesia is vital as it may enhance pain management strategies, reduce reliance on rescue analgesics (and their associated risks), and ultimately improve patient outcomes while lowering healthcare costs.

MATERIALS AND METHODS

The present randomized controlled study was conducted at Sree Mookambika Institute of Medical Sciences, Kulasekharam from January 2024 to December 2024. The study included 60 patients classified as ASA grade I or II, aged 18-65, of either gender, undergoing surgery under general anesthesia. Participants were randomly divided into two equal groups.

Group I (Preemptive): Received 1 gm of IV Paracetamol (100 ml) 30 minutes before the skin incision and 100 ml of Normal Saline 30 minutes before closure.

Group II (Preventive): Received 100 ml of IV Normal Saline 30 minutes before the skin incision and 1 gm of IV Paracetamol (100 ml) 30 minutes before closure.

Pre-Anaesthetic Checkup: A comprehensive pre-anesthetic evaluation was conducted one day prior to surgery. This included:

Physical Examination: Assessment of heart rate (HR), blood pressure (BP), respiratory rate, and a systemic examination.

Routine Investigations: Tests included hemoglobin (Hb), bleeding time (BT), clotting time (CT), liver function tests (LFT), renal function tests (RFT), complete urine examination, random blood sugar (RBS), electrocardiography (ECG), and chest X-ray.

Pain Assessment: Patients were educated about the Visual Analog Scale (VAS) for pain assessment, where scores range from 0 (no discomfort) to 10 (worst pain imaginable). The first dose of rescue analgesics was determined based on VAS scores at various time points: 0 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 8 hours, 12 hours, and 24 hours. A VAS score of 3 or above indicated the need for rescue analgesia.

Inclusion Criteria:

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ASA Grade I and II patients aged 18-65.

Patients undergoing open cholecystectomy under general anesthesia with a surgery duration of less than 2 hours.

Exclusion Criteria:

ASA Grade III and IV patients.

Patients who refused to participate.

Surgeries exceeding 2 hours.

STATISTICAL ANALYSIS AND RESULTS

	GROUP 1	GROUP 2
N	30	30
Missing	30	30
Mean	44.3	49.5
Median	43.0	50.5
Standard deviation	10.6	7.26
Minimum	22	35
Maximum	63	64

Age

	F	df1	df2	P
VAS SCORE AT 0 MI	3.01	1	41.8	0.090

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One-Way ANOVA (Welch's)

	F	df1	df2	p
VAS SCORE AT 15 MIN	196	1	44.5	<.001

One-Way ANOVA (Welch's)

	F	df1	df2	p
VAS SCORE AT 30 MIN	223	1	40.2	<.001

One-Way ANOVA (Welch's)

	F	df1	df2	p
VAS SCORE AT 1 hour	628	1	55.6	<.001

	F	df1	df2	p
VAS SCORE AT 0 MI	3.01	1	41.8	0.090
VAS SCORE AT 15 MIN	196.00	1	44.5	<.001
VAS SCORE AT 30 MIN	222.96	1	40.2	<.001
VAS SCORE AT 1 hour	628.03	1	55.6	<.001
VAS SCORE AT 2 hour	41.16	1	38.7	<.001
VAS SCORE 4 HOUR	230.10	1	51.9	<.001
VAS SCORE 8 HOUR	217.54	1	30.5	<.001
VAS SCORE 12 HOUR	73.49	1	52.9	<.001
VAS SCORE 24 HOUR	38.49	1	37.6	<.001

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In our study, there was a significant reduction in pain (VAS SCORE <3) from 15min equally in both groups and the first rescue analgesia was given after 4 hours in group 1 compared to 15minutes in group 2

DISCUSSION

Efficient pain control after surgery is a crucial aspect of patient care, particularly within the framework of Enhanced Recovery After Surgery (ERAS) programs, which aim to improve surgical outcomes. Effective management of postoperative pain remains one of the significant challenges, as many patients continue to experience inadequate pain relief despite advancements in pain management techniques and medications. Addressing this issue is vital for enhancing overall recovery and patient satisfaction following surgical procedures.

Achieving effective pain control hinges on administering appropriate interventions at the right time and dosage. Regular monitoring of patients for pain intensity and medication side effects is crucial for adjusting treatment plans as needed. Additionally, educating patients about available pain management options is essential for their engagement in the recovery process. This research evaluates the efficacy of preemptive and preventive analgesia on the postoperative need for rescue analgesics in surgical patients, aiming to enhance pain management strategies.

In our research, In our study, there was a significant reduction in pain (VAS SCORE <3) from 15min equally in both groups and the first rescue analgesia was given after 4 hours in group 1 compared to 15 minutes in group 2.

CONCLUSION

Administering IV Paracetamol preemptively in surgical patients leads to improved management of intraoperative hemodynamic parameters and extends the time before the first rescue analgesia is needed, indicating effective postoperative pain control. These outcomes align with the principles of Enhanced Recovery After Surgery (ERAS), promoting a faster recovery, reducing hospital stays, minimizing side effects, and enhancing overall patient satisfaction.

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