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A STUDY OF THE EFFICACY OF DEXAMETHASONE IN POSTOPERATIVE ANALGESIA IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK TO A LOCAL ANESTHETIC MIXTURE

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ABSTRACT

Background: Effective management of postoperative pain following upper limb surgeries is crucial for patient recovery and satisfaction. Dexamethasone is investigated as an adjuvant to local anesthetics in supraclavicular brachial plexus block (SCBPB) to prolong analgesic efficacy.

Methods: A 180-patient, randomised, double-blind, placebo-controlled elective upper limb surgery study was conducted at Bidar Institute of Medical Sciences. Participants received dexamethasone or saline local anaesthetic mixes. Measurements included opioid use, analgesia duration, pain levels, patient satisfaction, and complications.

Results: The addition of dexamethasone significantly extended the duration of analgesia (18.2 hours in Group A vs. 12.5 hours in Group B; $p < 0.001$). Opioid consumption and pain scores at 24 hours postoperatively were significantly lower in Group A, with higher patient satisfaction scores. No significant increase in complications was observed.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 11, 2024

Conclusion: In SCBPB, dexamethasone adjuvant prolongs analgesia, lowers opioid use, and improves patient satisfaction without worsening complications. This supports using dexamethasone in upper limb surgery postoperative pain regimes.

Keywords: Dexamethasone, Supraclavicular Brachial Plexus Block, Postoperative Pain, Local Anesthetic Adjuvant

INTRODUCTION

A key component of anaesthesia is still the efficient control of postoperative pain, which has a direct effect on patient happiness, recuperation, and overall hospital results. The supraclavicular brachial plexus block (SCBPB) is a commonly utilised technique for pain relief in upper limb surgeries [1,2]. This regional anaesthesia technique provides immediate postoperative analgesia while reducing the requirement for systemic opioids, commonly linked to adverse side effects. The primary limitation of local anaesthetics in supraclavicular brachial plexus block (SCBPB) is their limited duration of action, potentially leading to early postoperative pain [3,4].

Dexamethasone has been investigated as an additional treatment to overcome this restriction. Dexamethasone, a synthetic corticosteroid, has shown potential to prolong the analgesic effects of local anaesthetics when utilised as an adjuvant in regional anaesthesia blocks [5]. The proposed mechanisms include anti-inflammatory properties and the suppression of pain signal transmission through the reduction of neuronal excitability. When used with local anaesthetics, dexamethasone may considerably extend the duration of analgesia, improving patient comfort and lowering the need for additional analgesics during the recovery phase, according to mounting data [6,7].

In light of these encouraging results, further thorough investigation is required to thoroughly assess the safety and effectiveness of dexamethasone as a supplement to local anaesthetics in SCBPB. The objective of this research is to present a thorough examination of the impact of dexamethasone on patient satisfaction, the length of postoperative analgesia, and the total amount of opioids and other analgesics used after surgery [8,9]. This study will shed light on the potential risks and clinical benefits of using dexamethasone as an adjuvant in SCBPB by comparing the pain scores, timing of the first analgesic request, total analgesic consumption,

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and side effects of patients receiving the standard local anaesthetic mixture with and without dexamethasone [10,11].

The primary aim of this study is to evaluate the efficacy of dexamethasone in enhancing the duration and quality of postoperative analgesia when added to a local anesthetic mixture in supraclavicular brachial plexus block, focusing on its impact on pain management, reduction in opioid consumption, and improvement in patient satisfaction during the recovery phase of upper limb surgeries. Through this investigation, we intend to establish evidence-based recommendations for the inclusion of dexamethasone in SCBPB, potentially setting a new standard in postoperative pain management for upper limb surgical procedures.

METHODOLOGY

Study Design Dexamethasone is tested as an adjuvant to local anaesthetics in supraclavicular brachial plexus block in this randomised, double-blind, placebo-controlled trial. Analgesic duration, opioid intake, and patient satisfaction will be compared between two groups: one getting the local anaesthetic mixture with dexamethasone and the other with a placebo.

Study Population SCBPB will register 180 elective upper limb surgery patients at Bidar Institute of Medical Sciences, Bidar, Karnataka, over six months. Patients aged 18–65, of either sex, with ASA physical status I or II will be included. Contraindications to regional anaesthesia, allergy to study drugs, severe pain, and long-term steroid use will exclude participants.

Randomization and Blinding Computer-generated random numbers will allocate patients to Group A (local anaesthetic + dexamethasone) or Group B (placebo). Postoperative patients and doctors will be blinded to group assignments. An impartial anaesthesiologist will prepare the medication mixes without patient administration or assessment.

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 11, 2024

Intervention Group A will receive a mixture of 30 ml of 0.5% ropivacaine with 8 mg of dexamethasone added, while Group B will receive 30 ml of 0.5% ropivacaine with saline as a placebo. All blocks will be performed using ultrasound guidance to ensure proper placement of the anesthetic.

Outcome Measures The duration of analgesia from block administration to the first request for more will be the main outcome measure. Secondary outcomes include total opioid consumption in the first 24 hours postoperatively, pain scores at 1, 6, 12, and 24 hours using a numerical rating scale (0-10), patient satisfaction with pain management (from a 5-point Likert scale), and anesthesia complications or side effects.

Data Collection and Analysis Preoperative, intraoperative, and postoperative data will be obtained at intervals. Statistics will be done with SPSS. Descriptive statistics will summarise the data, while inferential statistics like the t-test or Mann-Whitney U test for continuous variables and chi-square tests for categorical variables will compare outcomes between groups. Statistically significant p-values are below 0.05.

RESULTS

Bidar Institute of Medical Sciences enrolled 180 individuals, 90 in each group, for the study. Both groups had similar demographics and baseline characteristics. Dexamethasone as an adjuvant in the supraclavicular brachial plexus block prolonged analgesia and lowered opioid intake without worsening side effects.

Table 1: Demographic and Baseline Characteristics

Characteristic	Group A (Dexamethasone)	Group B (Placebo)

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 11, 2024

Age (years, mean ± SD)	42 ± 10	43 ± 11
Sex (M/F)	55/35	53/37
Weight (kg, mean ± SD)	70 ± 12	72 ± 13
ASA Status (I/II)	45/45	48/42

SD: Standard Deviation, M: Male, F: Female, ASA: American Society of Anesthesiologists

Table 2: Primary Outcome - Duration of Analgesia (hours)

Group	Duration of Analgesia (mean ± SD)	p-value
Group A (Dexamethasone)	18.2 ± 2.4	<0.001
Group B (Placebo)	12.5 ± 1.8	

This table shows that the mean duration of analgesia was significantly longer in Group A compared to Group B, with a statistically significant difference ($p < 0.001$).

Table 3: Secondary Outcomes

Outcome	Group A (Dexamethasone)	Group B (Placebo)	p-value
Opioid Consumption (mg, mean ± SD)	10 ± 5	30 ± 10	<0.001
Pain Scores at 24 hours (0-10 scale)	2 ± 1	4 ± 2	<0.001
Patient Satisfaction (1-5 scale)	4.5 ± 0.5	3.2 ± 1.0	<0.001
Complications (n, %)	2 (2.2%)	3 (3.3%)	0.710

SD: Standard Deviation

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 11, 2024

Group A had considerably lower opioid intake, 24-hour pain scores, and patient satisfaction than Group B in secondary outcomes. Complication rates were similar between groups. This study found that adding dexamethasone to SCBPB's local anaesthetic mixture prolonged analgesia, reduced opioid use, and enhanced patient satisfaction without increasing problems. These results imply that SCBPB upper limb surgery patients may benefit from dexamethasone for postoperative pain management.

DISCUSSION

The results of the current study at the Bidar Institute of Medical Sciences highlight how well dexamethasone works in supraclavicular brachial plexus block (SCBPB) when used as an adjuvant to local anaesthetics. The findings align with the growing body of research suggesting that dexamethasone prolongs analgesic duration when used in conjunction with local anaesthetics in regional anaesthesia. Notably, patients in the dexamethasone group (Group A) had analgesia for around 18.2 hours, while those in the placebo group (Group B) experienced analgesia for 12.5 hours ($p < 0.001$). The findings align with previous research, including studies by Albrecht et al. and Choi et al., which indicated prolonged analgesic effects associated with dexamethasone in peripheral nerve blocks [13,14].

Additionally, the decrease in opioid intake seen in Group A (10 mg ± 5) as opposed to Group B (30 mg ± 10) is consistent with research by Fredrickson et al., highlighting the adjuvant's function in lowering the requirement for opioid analgesia following surgery [15]. The study indicated that patient satisfaction ratings were higher in the dexamethasone group, highlighting a significant outcome in the context of enhancing postoperative patient experiences. The improvement in patient satisfaction regarding pain management strategies is corroborated by existing literature, notably a meta-analysis by De Oliveira et al., which emphasized enhanced patient-reported outcomes associated with dexamethasone use [16].

Additionally, our study's lack of a significant rise in problems across the groups (2.2% in Group A vs. 3.3% in Group B; $p = 0.710$) confirms the safety profile of dexamethasone as an adjunct and is consistent with the safety findings reported by Wang et al. [17]. This aspect is significant as it indicates that the advantages of dexamethasone are not associated with an increased incidence of adverse events. To improve knowledge and maximise therapeutic results, future studies on dexamethasone as an adjuvant in supraclavicular brachial plexus block (SCBPB)

ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 11, 2024

should focus on a few important areas. Investigating the dose-response relationship of dexamethasone is essential to identify the optimal dosage that maximises analgesic duration and minimises potential side effects [18]. Furthermore, comparative studies examining alternative corticosteroids or various adjuvants may yield insights into their relative efficacy and safety profiles, which could enhance pain management protocols. Long-term follow-up studies are necessary to evaluate potential postponed adverse effects and the overall influence on recovery and rehabilitation. Investigating patient-specific outcomes across different surgical contexts will enhance anaesthesia practices to meet individual requirements, thereby advancing personalised medicine in regional anaesthesia [19].

CONCLUSION

The addition of dexamethasone to SCBPB local anaesthetic mixture prolongs analgesia, reduces opioid intake, and improves patient satisfaction without raising complications. These data support routine dexamethasone use in SCBPB upper limb operations. To improve therapeutic usage of dexamethasone, future research may examine optimal dose and comparisons with other adjuvants.

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ISSN: 0975-3583,0976-2833 VOL 15, ISSUE 11, 2024

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