Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/19172
DOI URL: http://dx.doi.org/10.21474/IJAR01/19172

RESEARCH ARTICLE

EFFICACY OF DEXAMETHASONE AS AN ADJUVANT TOBUPIVACAINE IN SUPRA CLAVICULAR BRACHIAL PLEXUS BLOCK:A COMPARATIVE STUDY

Dr. CH. Sandeep[1], Dr. G Sahithi Priya[1] and Dr. K. Chenna Kesava Swamy[2]

1. MBBS, (MD).
2. MBBS, MD., Associate Professor.

Manuscript Info

Manuscript History
Received: 31 May 2024
Final Accepted: 30 June 2024
Published: July 2024

Abstract

Aim: To compare the efficacy of Dexamethasone when combined with Bupivacaine to Bupivacaine alone in terms of their analgesic efficacy and onset time of sensory and motor blockades for procedures involving the upper limb in Supraclavicular Brachial Plexus Block.

Introduction: The rise in pain therapy, the superiority of regional anaesthesia in urgent procedures, and the growing significance of outpatient surgery in anaesthesiology require a specialised focus on peripheral nerve blocks. In the case of upper limb procedures, the elected choice during regional anaesthesia is the blocking of the supraclavicular brachial plexus.

Materials and methods: It is a randomised controlled trial; the study was undertaken in patients posted for elective and emergency upper limb surgeries. 100 patients aged 20 to 60 years with ASA classes 1 and 2.The participants were assigned to two groups by a random process.

Group A –Was given Bupivacaine alone.

Group B – Was given Bupivacaine along with Dexamethasone.

Results: Group B patients had a prolonged duration of analgesia and premature initiation of both sensory and motor paralysis.

Discussion: The addition of Dexamethasone 8mg along with 0.5% Bupivacaine in the Supra clavicular brachial plexus block extends the length of pain relief and provides the premature beginningof both sensory and motor blockades, reducing the requirement of rescue pain relievers.

Conclusion: The addition of Dexamethasone 8mg along with 0.5% Bupivacaine in Supra clavicular brachial plexus block provides early onset time of both sensory and motor blockades and prolongs the duration of analgesia.

Introduction:-

Pain is a significant concern for patients after surgery, especially following orthopaedic surgeries. Various methods like general or regional anaesthesia are used by the anaesthesiologists to relieve pain in the patients. Regional anaesthesia is a widely used procedure in terms of effectiveness and patient acceptability. Peripheral nerve blockade provides pain relief and aid with movement, either in conjunction with general anaesthesia or as the main

Corresponding Author:- Dr. CH. Sandeep
Address:- MBBS, (MD).

anaesthetic.[1]Nowadays, peripheral nerve block is a well-recognised idea for complete anaesthetic care. There is an increase in the role of peripheral nerve blockin surgical procedures to include it for managing postoperative pain andpersistent ache. The use of peripheral nerve blockade has brought better outcomes to the subject by speeding their recovery, reducing anaesthesia-related side effects, and improving postoperative pain control.When used in a multimodal analgesic approach, peripheral nerve blocks have shortened recovery periods by minimizing postoperative issues such as nausea, vomiting, and drowsiness.[2]

The rise of pain management, the superiority of regional anaesthesia in urgent procedures, and the growing significance of outpatient surgery in anaesthesiology require a specialised focus on peripheral nerve blocks. In the case of upper limb procedures, the elected choice during regional anaesthesia is the blocking of the supraclavicular brachial plexus. The brachial plexus is most densely concentrated at the proximal division or trunk level,providing the most reliable anaesthesia for surgeries involving the upper limb by numbing the median, ulnar, and radial nerves in over 80% of cases, as well as the middle and lower plexus. When the supra clavicular approach is used to achieve the brachial plexus, the entire upper extremity is blocked. The complete nerve innervations (sensory, motor and sympathetic) to the upper extremity are blocked via this approach, where the C5 to T1 levels of nerve roots in the brachial plexus are occluded.[3]

In addition to supraclavicular brachial plexus block, other frequently employed methods include:
a) Infraclavicular approach
b) Axillary approach
c) Interscalene approach

Several surgical procedures use regional nerve blocks to treat postoperative pain by blocking signal transmission to the dorsal horn and administering local anaesthetics. Some medications are combined with local anaesthesia agents to decrease the dosing quantity of each agent, improve pain relief, and decrease the occurrence of negative reactions. Bupivacaine and ropivacaine, common long-acting local anaesthetics, typically offer around 11 hours of relief in the pain without epinephrine and roughly 12 hours with epinephrine. There is a requirement to generate suitable adjuvants to increase the pain-free duration while using single-shot procedures. Bupivacaine's action span ranges from 3 to 8 hours depending on slow onset and either incomplete or patchy analgesia. Several adjuvants, such as clonidine, midazolam, neostigmine, and tramadol, have been studied over the years.[5] These offer only slight extensions or come with unwanted side effects. The perfect adjuvant that extends pain relief with a positive adverse reaction has not been found yet.

Dexamethasone seems to be a popular recent chemical of attention. While early results indicate significant block extension with no negative effects, a literature review has raised concerns over safety and the optimal delivery method.[6] Animal and human literature have implicated that the utilization of Dexamethasone, a synthetic corticosteroid, as an auxiliary to local anaesthesia agents, has increased the duration of the block. It is a potent, long-acting glucocorticoid with minimal mineralocorticoid activity. Steroids block the activity of phospholipase A2 and cyclooxygenase two, thereby reducing prostaglandin production, which decreases hyperalgesia. Analgesic and anti-inflammatory effects are exhibited by steroids.[7]

Aims and Objectives

In order to determine the superior analgesic efficacy for upper limb procedures in supraclavicular brachial plexus block, a comparative evaluation is conducted between Bupivacaine administered alone and Bupivacaine administered in conjunction with Dexamethasone.

1. To study the onset of sensory blockage.
2. To study the onset of motor blockage.
3. To study the duration of analgesia.

Materials &Methods:-

Study design:

A Prospective randomized comparative clinical study.

Method of data collection:
Data on age, sex, weight, and other factors that matched the study's objectives were gathered using the pre-tested proforma.

Study population:
All patients between the ages of 20 and 60, with an ASA (American Society of Anaesthesiologists) classification of 1 or 2, were scheduled for both elective and emergency upper limb procedures under supraclavicular brachial plexus block.

Sample size:
100 patients with ASA 1 and 2 who are posted for elective and emergency upper limb surgeries under supra clavicular brachial plexus block.

Sampling criteria:
Inclusion Criteria:
Encompassed individuals of both genders, classified under American Society of Anaesthesiologists (ASA) Physical Status 1 and 2, aged between 20 and 60 years. Furthermore, eligible participants were required to provide written and informed consent for their participation in the research and express willingness to actively engage in the research process. Moreover, upper limb surgical procedures performed under supra clavicular brachial plexus blockade, whether elective or emergency, were included in the inclusion criteria.

Exclusion Criteria:
Comprised of individuals classified as ASA Physical Status 3 and 4, those with any bleeding disorder or receiving anticoagulant therapy, as well as those presenting with contralateral lung injury, rib fracture, pre-existing neuropathy affecting the surgical limb, or local infection at the injection site. Additionally, individuals with a documented history of allergy to local anaesthetics, peptic ulcer disease, hepatic or renal failure (precluding steroid administration), pregnant women, and those who had received systemic corticosteroids for a duration of two weeks or longer within six months prior to surgery were excluded from participation. Moreover, patients unwilling to engage in the study or to provide written informed consent were not considered eligible.

Statistical Analysis
Continuous variables were shown as means with standard deviations (mean ± SD), whereas categorical data were provided as frequencies and percentages (n and %). The t-test was employed for comparing two groups when the data followed a normal distribution. For experimental parameters such as the onset of sensory and motor blockade, analgesic duration, and visual analogue scores, independent t-tests were conducted to compare the two groups. One-way ANOVA was utilized for multiple comparisons across different time intervals. All statistical analyses were two-tailed and performed at a significance level of $\alpha=0.05$.

Methodology:-
The current investigation is being conducted at Santhiram Medical College and General Hospital, Nandyal, encompassing a cohort of 100 patients within the age range of 20 to 60 years classified as American Society of Anaesthesiologists (ASA) grade 1 and 2, who are listed to undergo the elective and emergency upper limb surgeries for a duration of 6 months.The research involves the implantation of supraclavicular brachial plexus blockers after receiving institutional ethics committee approval. Furthermore, each participating patient has provided written informed consent.

Data was systematically collected utilizing a pre-tested proforma comprising demographic variables such as age, sex, height and weight, alongside additional parameters aligning with the study objectives. The initial assessment encompassed a comprehensive review of medical history, supplemented by a thorough general physical and systemic examinations. Baseline laboratory investigations comprised a Complete Blood Count (CBC), Blood Urea Nitrogen (BUN), serum creatinine, viral screening, Blood Glucose (glucose levels), LFT, X-ray chest, and Electrocardiogram (ECG) and Echo wherever necessary. Subsequently, participants were randomized into either Group A (control group) or Group B (study group) employing the slips-in-box method.

Upon arrival at the operating room, all enrolled patients underwent the initiation of an 18-gauge intravenous (IV) line in the contralateral arm, in addition to the attachment of standard monitoring devices, including pulse oximetry,

non-invasive blood pressure (NIBP) cuff, electrocardiogram (ECG) leads. Baseline recordings of pulse rate, blood pressure, and oxygen saturation were diligently documented.

Group A (Control)

DRUG	TOTAL VOLUME – 28ml
Bupivacaine 0.5%	25ml
Distilled water	3ml

Group B (Study)

DRUG	TOTAL VOLUME – 28ml
Bupivacaine 0.5%	25ml
Dexamethasone 8mg	2ml
Distilled water	1ml

The 10 ml syringes are used to administer local anaesthetics, and they are stored in sterile bowls.

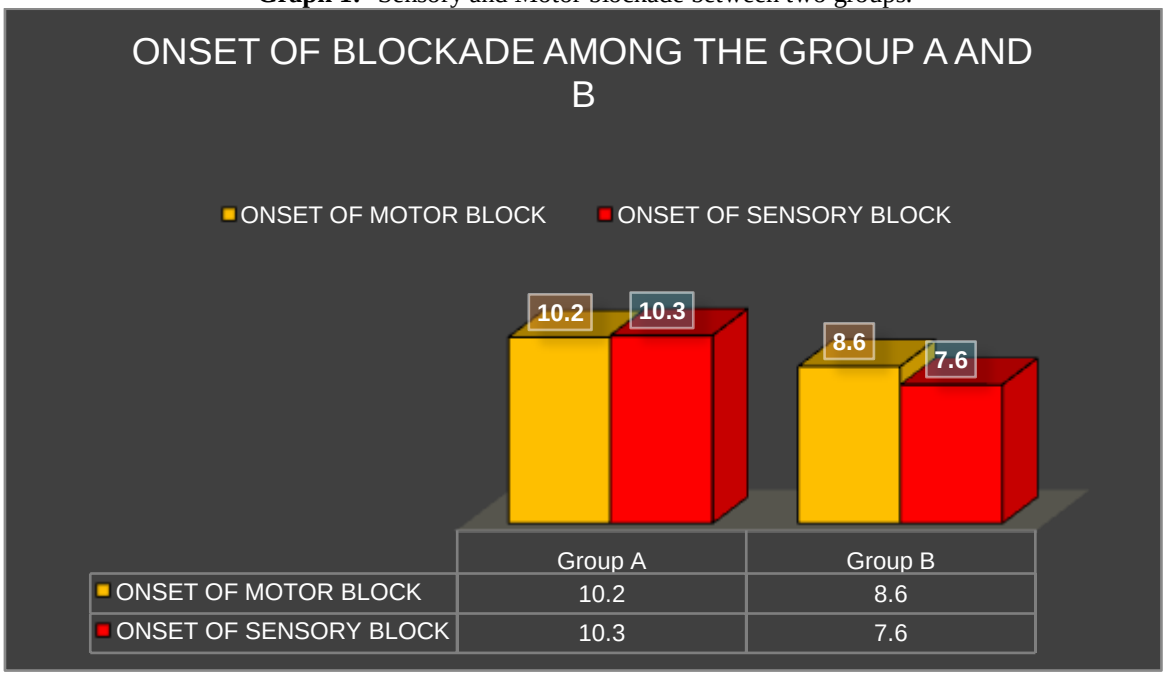
Oxygen is administered through a face mask at a rate of 4L/min. Midazolam is administered intravenously at a dose of 1mg. The equipment set includes a nerve stimulator, a 50mm insulated needle, ECG electrodes, two 10 ml syringes, a skin marker pencil, a 1 ml tuberculin syringe, a stainless-steel sterile bowl for preparing local anaesthetic drugs, and sterile gauze pieces. The supraclavicular block was performed using a classical approach with the guidance of a nerve stimulator.

Results:-

Table 1:- Comparison Of Onset Of Motor And Sensory Blockade.

VARIABLE	GROUP A (n=50)	GROUP B (n=50)	P VALUE
ONSET OF MOTOR BLOCK (MINUTES)	10.2±3.4min	8.6±3.2min	0.017
ONSET OF SENSORY BLOCK (MINUTES)	10.36±3.7min	7.6±4.5min	0.01

Graph 1:- Sensory and Motor blockade between two groups.



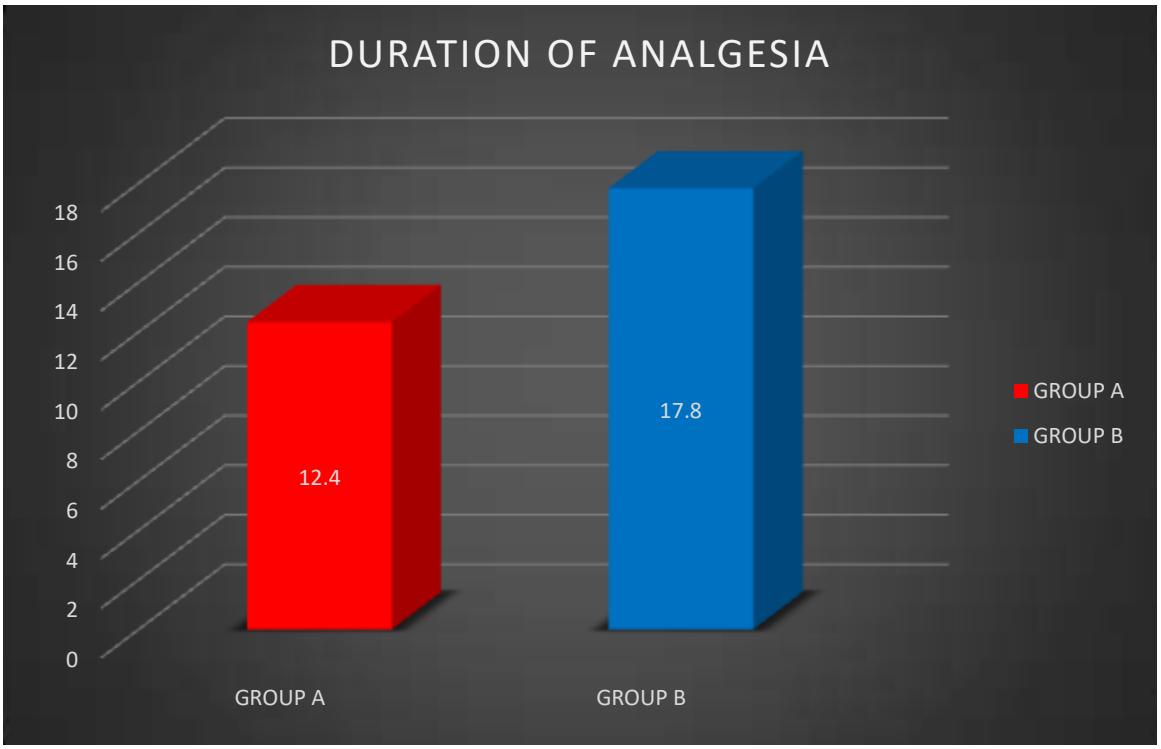
The onset timing of motor and sensory blockages between participants in Group A and Group B is depicted in the above table 1. In participants in Group A, the onset times of motor block and sensory block were 10.2± 3.4 and

10.36 ± 3.7 minutes, respectively. The motor and sensory block onset periods in Group B participants were 8.6 ± 3.2 and 7.6 ± 4.5 minutes, respectively.

Table 2:- Comparison Of Duaration Of Analgesia Between Two Groups.

VARIABLE	GROUP A (n=50)	GROUP B (n=50)	P VALUE
DURATION OF ANALGESIA (HOURS)	12.4±4.7(hrs)	17.8±1.8(hrs)	0.001

Graph 2:- Duration of analgesia between two groups.



As shown in table 2, The duration of analgesia in Group A is 12.4 ± 4.7 hours and Group B is 17.8 ± 1.8 hours, thus duration of analgesia in Group B is prolonged with p=0.001 which is statistically significant.

Discussion:-

Regional anaesthesia has become more common recently, but general anaesthesia is still the preferred option for the majority of surgical procedures. With clear advantages over both general anaesthesia and intravenous regional anaesthesia techniques, regional anaesthesia is known for its ease of use, safety, and effectiveness.

Compared to general anaesthesia, brachial plexus block has several benefits, such as early patient release, a smooth transition from anaesthesia to pain management, improved peripheral blood flow, a decreased risk of nausea and vomiting, less drowsiness, and the avoidance of tracheal intubation. When doing treatments on the upper limbs, the supraclavicular brachial plexus block is a commonly used regional nerve block for anaesthesia and pain management. Dexamethasone was used in this experiment as a supplement to local anaesthetics.

This study was designed as a prospective, double-blind, controlled, randomised experiment. One hundred patients undergoing upper limb procedures below the shoulder joint got supraclavicular brachial plexus block. Patients were divided into two groups at random using a normal randomisation procedure. Patients in Group B received dexamethasone in addition to bupivacaine, whereas patients in Group A received bupivacaine alone.

This study sought to determine how well Dexamethasone, and 0.5% bupivacaine worked together for supraclavicular brachial plexus block. Two particular characteristics were the focus of the study: the length of analgesia and the time at which sensory and motor blockade began.

The start of the sensory block occurred in 10.36 ± 3.7 minutes on average for group A and 7.6 ± 4.5 minutes on average for group B. With a p-value of 0.01, this difference between the two groups was statistically significant. The start of the motor block also showed a significant statistical difference (p=0.017), with a mean of 10.2 ± 3.4 minutes in group A and 8.6 ± 3.2 minutes in group B of subjects. Compared to group A, group B experienced sensory and motor blockades more quickly. In group B, analgesia lasted 17.8 ± 1.8 hours, a statistically significant period. On the other hand, group A experienced analgesia for 12.4 ± 4.7 hours.

According to Yadav RK et al. (7), the local anaesthetic plus Dexamethasone group had sensory and motor block far earlier than the control group. Extensive research has reliably shown that adding Dexamethasone to local anaesthetic solutions extends their duration of effect. likewise noted that the dexamethasone group needed less rescue analgesia than the control group.

Conclusion:-

This study concluded that dexamethasone had a numberof benefits when combined with 0.5% bupivacaine as an adjuvant for upper limb procedures performed by supraclavicular brachial plexus block.

1. A quicker onset of sensory block.
2. A quicker onset of motor block.
3. Extended duration of analgesia.

References:-

1. Cummings KC, Napierkowski DE, Parra-Sanchez I, Kurz A, Dalton JE, Brems JJ, et al. Effect of Dexamethasone on the duration of interscalene nerve blocks with ropivacaine or Bupivacaine. Br J Anaesth. 2011 Sep;107(3):446–53.
2. Murauski JD, Gonzalez KR. Peripheral Nerve Blocks for Postoperative Analgesia. AORN Journal. 2002 Jan;75(1):134–47.
3. Brown DL. Brachial plexus anesthesia: an analysis of options. Yale J Biol Med. 1993;66(5):415–31.
4. Kulenkampff D. Brachial plexus anaesthesia: its indications, technique, and dangers. Ann Surg. 1928 Jun;87(6):883–91.
5. Neal JM, Gerancher JC, Hebl JR, Ilfeld BM, McCartney CJL, Franco CD, et al. Upper Extremity Regional Anesthesia: Essentials of Our Current Understanding, 2008. Regional Anesthesia and Pain Medicine. 2009 Mar;34(2):134–70.
6. Noss CD, MacKenzie LD, Kostash MA. Adjuvant Dexamethasone: innovation, farce, or folly? Reg Anesth Pain Med. 2014;39(6):540–5.
7. Yadav R, Sah B, Kumar P, Singh S. Effectiveness of addition of neostigmine or Dexamethasone to local anaesthetic in providing perioperative analgesia for brachial plexus block: A prospective, randomized, double-blinded, controlled study. Kathmandu Univ Med J. 1970 Jan 1;6(3):302–9.