

0.25% Bupivacaine with 50mcg Clonidine Versus 0.25% Bupivacaine with 8mg Dexamethasone Versus 0.25% Bupivacaine Alone as Adjuvant on Fascia Iliaca Compartment Block (FICB) in Femoral Fractures by Internal Fixation and Open Reduction Procedures

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Received: 25-08-2024 / Revised: 23-09-2024 / Accepted: 26-10-2024

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Conflict of interest: Nil

Abstract:

Introduction: Femoral fractures result in intense discomfort during movement when setting for anaesthetic procedures. The fascia iliaca compartment nerve block (FICB) is a frequently utilized pain management method that efficiently delivers analgesia. Dexamethasone and clonidine serve as effective adjuvants to local anesthetics, providing significant analgesic benefits with few side effects. This study aimed to evaluate the effectiveness of bupivacaine in conjunction with clonidine, bupivacaine with dexamethasone, and bupivacaine alone for fascia iliaca compartment block in femoral fracture cases.

Materials and Methods: Ninety-six cases undergoing proximal femoral operations were randomly allocated into three study groups (n=32 each). Group B was administered 0.25% bupivacaine combined with 2 ml of normal saline, group BC received 0.25% bupivacaine with 50 mcg of clonidine, and group BD was given 0.25% bupivacaine with 8 mg of dexamethasone. Haemodynamic parameters, VAS score, supplementary analgesic requirements, and analgesia duration were evaluated.

Results: The mean differences in hemodynamic parameters were statistically significant at 15, 30, 45, 60, and 90 minutes ($p < 0.05$). The needed analgesic dosages were 4.99 in group B, 3.05 in group BC, and 2.93 in group BD. The cohort administered bupivacaine in conjunction with dexamethasone (13.99 hours) demonstrated a prolonged analgesic effect, succeeded by Group BC (12.67 hours) and Group B (6.23 hours). The mean VAS score exhibited statistical significance between the study groups ($p < 0.05$).

Conclusion: The combination of 0.25% bupivacaine with 8mg Dexamethasone provided better analgesic duration and required less rescue analgesia on the first postoperative day in patients having femoral operations under FICB compared to 0.25% bupivacaine with 50mcg clonidine.

Keywords: Femoral fractures, Fascia iliaca Compartment Block (FICB), Analgesia.

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Introduction

Regional anesthesia is the most common treatment for femoral fractures. Positioning for neuraxial blocks is always difficult since even a minor overriding of the fracture ends causes considerable pain [1]. However, setting for neuraxial blockade can cause considerable pain, necessitating the use of optimal analgesia even after surgery.

Fascia iliaca compartment nerve block (FICB) is a regularly used treatment for femoral fracture pain. Place the needle tip under the fascia iliaca, approximately in the lateral third of the line connecting the anterior superior iliac spine to the pubic tubercle [2,3]. This technique not only

provides effective analgesia but also minimizes the need for systemic opioids, which can have adverse effects on recovery. By utilizing FICB, clinicians can enhance patient comfort and promote earlier mobilization post-surgery, ultimately leading to improved outcomes.

The administration of local anesthetics with adjuvants exhibited extended analgesic effects and reduced the necessity for rescue analgesia [4]. Numerous adjuvants, including opioids, clonidine, ketamine, epinephrine, dexmedetomidine, and dexamethasone, are accessible and, in conjunction with local anesthetics, may enhance postoperative

analgesia [5]. Conventional methods employ Bupivacaine, a long-acting local anesthetic, to facilitate postoperative analgesia. Numerous additives, including opioids, nonopioids, and α 2-adrenergic agonists like clonidine, are being used with bupivacaine in various nerve blocks [6]. Dexamethasone serves as an effective adjuvant, demonstrating significant analgesic properties with few side effects. Dexamethasone exerts systemic effects by attenuating the inflammatory response associated with surgical tissue damage [7]. Clonidine, an α 2-adrenoceptor agonist, possesses significant antinociceptive effects. Nonetheless, the utilization of clonidine is limited owing to its adverse consequences [8].

This study was conducted to assess the efficacy of bupivacaine combined with clonidine, bupivacaine combined with dexamethasone, and bupivacaine alone for fascia iliaca compartment block in cases of femoral fractures. The aim was to identify the combination that offered optimal pain relief with minimal side effects. We hypothesized that the amalgamation of bupivacaine and clonidine would produce enhanced outcomes relative to alternative treatment protocols, owing to clonidine's antinociceptive characteristics.

Materials and Methods

This prospective randomized study was conducted in the Department of Orthopedics in association with Department of Anesthesiology, at Apollo Institute of Medical Sciences and Research, Jubilee Hills, Hyderabad, from January 2023 to August 2024. Ninety-six cases undergoing proximal femoral surgeries under subarachnoid block attending AIMSRS were recruited.

Inclusion and exclusion criteria:

Patients with femoral fractures scheduled for open reduction and internal fixation, aged over 21 years, classified as ASA grade I and II, and consenting to participate were included in the study. Exclusion criteria included peripheral neuropathy, local site

infection, and obesity, allergy history to local anesthetics, prior femoral surgeries, and inflammation at the operated site. Informed consent was obtained from all participants, and the study protocol received approval from the institutional ethics committee.

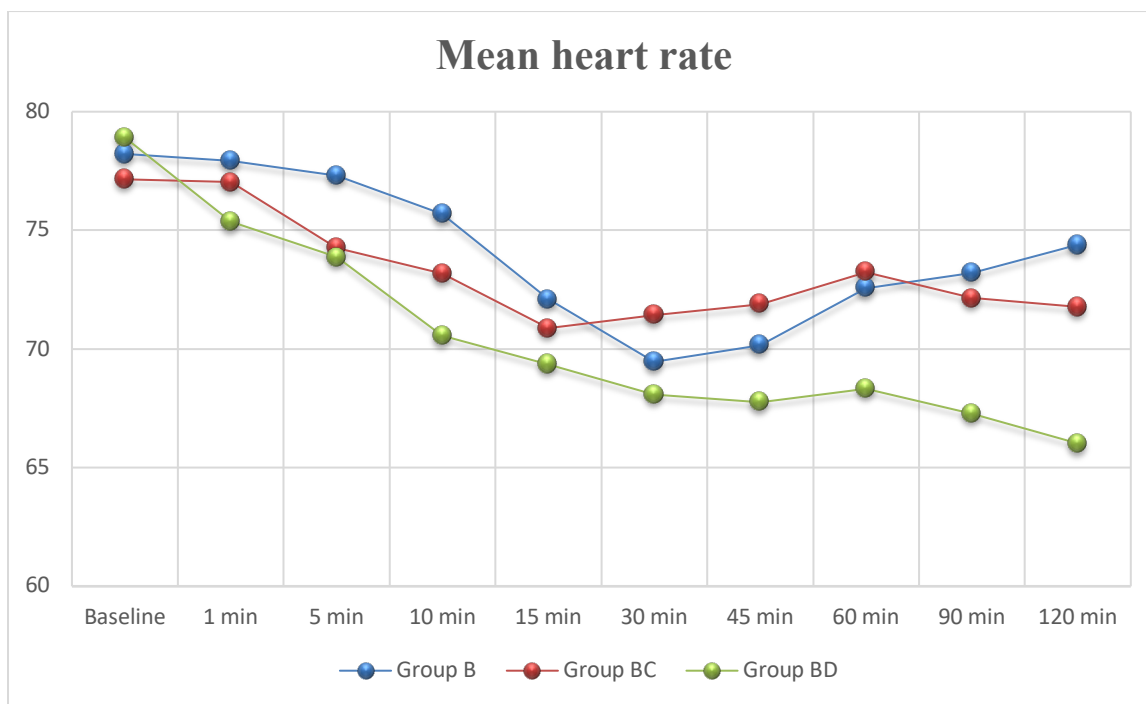
Study groups: Participants in the study were randomly assigned to three groups. Group B (n=32) was administered 38 ml of 0.25% bupivacaine combined with 2 ml of normal saline. Group BC (n=32) received 38 ml of 0.25% bupivacaine with 2 ml of 50 mcg clonidine, while group BD (n=38) was treated with 38 ml of 0.25% bupivacaine and 2 ml of 8 mg dexamethasone.

Study Procedure: A fascia iliaca compartment block guided by ultrasonography was performed on all patients in the preoperative waiting area thirty minutes before their transfer to the operating room. Prior to the operation, the team documented the vital parameter readings. We administered a standard subarachnoid block to each subject and monitored their response to the onset of sensory and motor blocks. Once we achieved the necessary amounts of analgesia, we carried out the surgery. Recordings were made of the intraoperative hemodynamic parameters. Upon the patient's transfer to the postoperative room, we recorded vital signs such as oxygen saturation levels, heart rate, systolic and diastolic blood pressure, and mean arterial pressure, in addition to other hemodynamic metrics. We assessed the VAS score on the first postoperative day at two, six, twelve, eighteen-, and twenty-four-hours following transfer to the postoperative care unit. The collected data was analysed by using SPSS version 26.0. Percentages and frequencies were used to depict categorical data. To find out how important the qualitative data was, the chi-squared test was used. P-values less than 0.05 determined statistical significance.

Results

Table 1: Demographic profile of study participants.

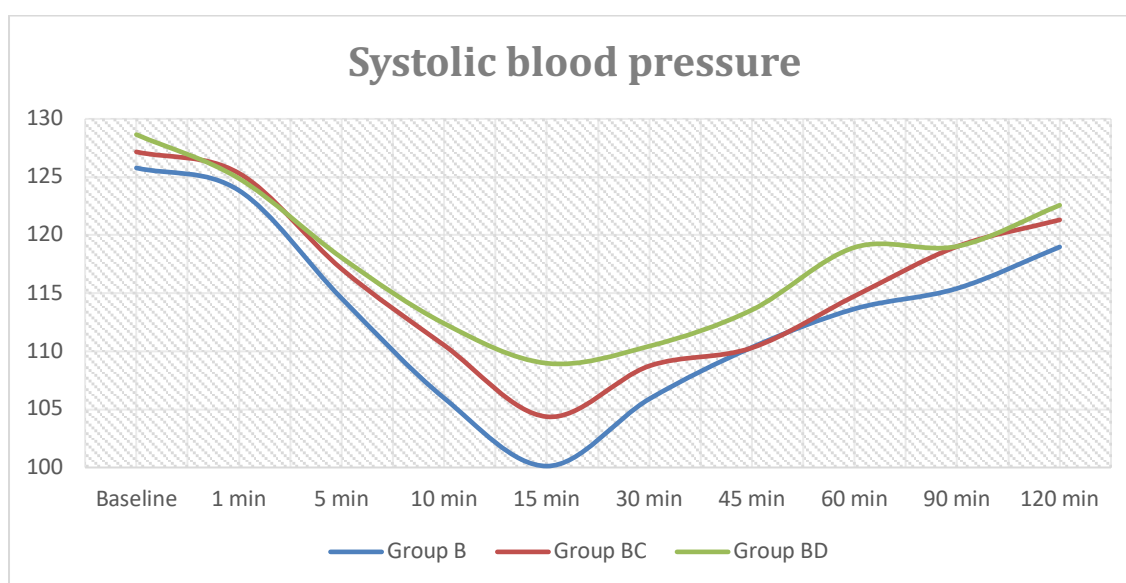
Demographic variables	Group B (n=32)		Group BC (n=32)		Group BD (n=32)	
	Mean±SD		Mean±SD		Mean±SD	
Age	58.38±2.10		55.41±3.69		57.89±2.55	
Weight	68.67±5.23		68.12±4.45		66.76±4.78	
BMI (kg/m ²)	27.32±1.75		26.14±1.98		25.79±2.26	
Gender (M:F)	18:14		20:12		17:15	
ASA status	I	13 (40.62%)	14 (43.75%)	12 (37.5%)		
	II	19 (59.38%)	18 (56.25%)	20 (62.5%)		



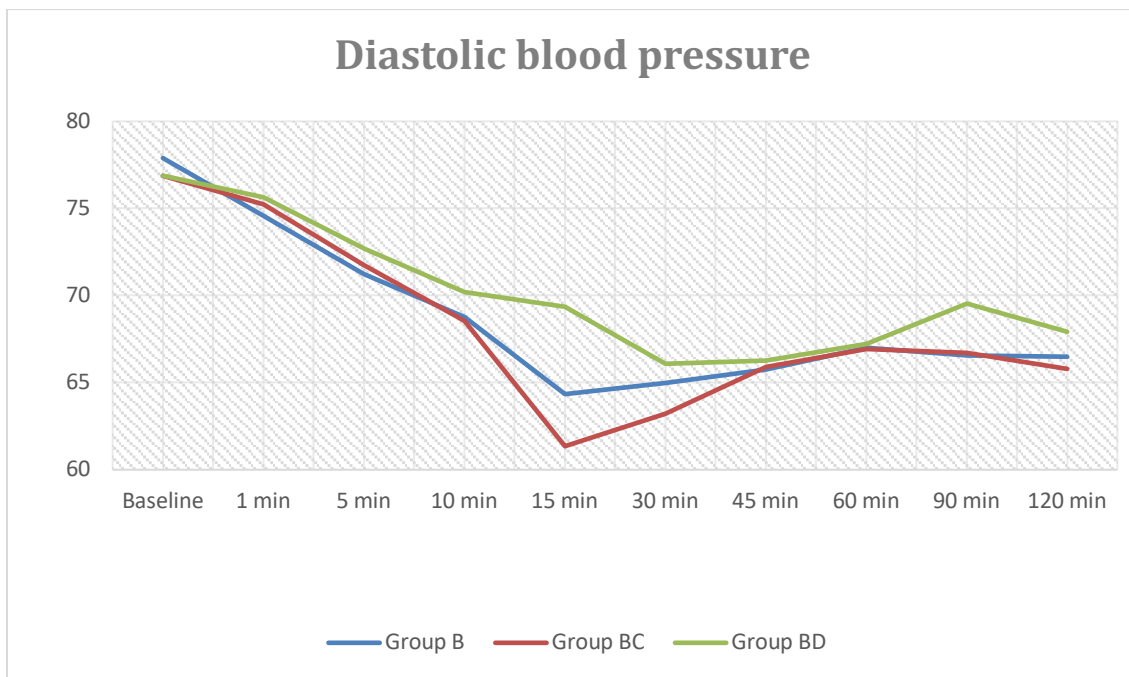
Graph 1: Levels of mean heart rate

Table 2: Mean arterial pressure

Duration (In min)	Mean Arterial Pressure			
	Group B	Group BC	Group BD	P-value
Baseline	95.21±6.59	94.37±7.65	94.76±8.22	0.001
1 min	94.15±6.90	93.54±6.97	93.72±8.30	0.542
5 min	93.76±6.45	92.81±6.78	93.01±8.43	0.970
10 min	87.34±5.89	87.32±6.32	89.55±8.24	0.432
15 min	80.21±6.74	78.76±6.10	82.31±7.36	0.001
30 min	78.89±7.56	78.99±7.75	80.78±5.87	0.001
45 min	78.99±6.98	79.46±8.09	81.09±6.31	0.045
60 min	81.27±6.47	81.78±7.23	82.45±4.56	0.031
90 min	82.34±6.66	84.89±6.04	84.33±4.38	0.034
120 min	86.89±7.73	87.54±7.66	87.70±5.45	0.041



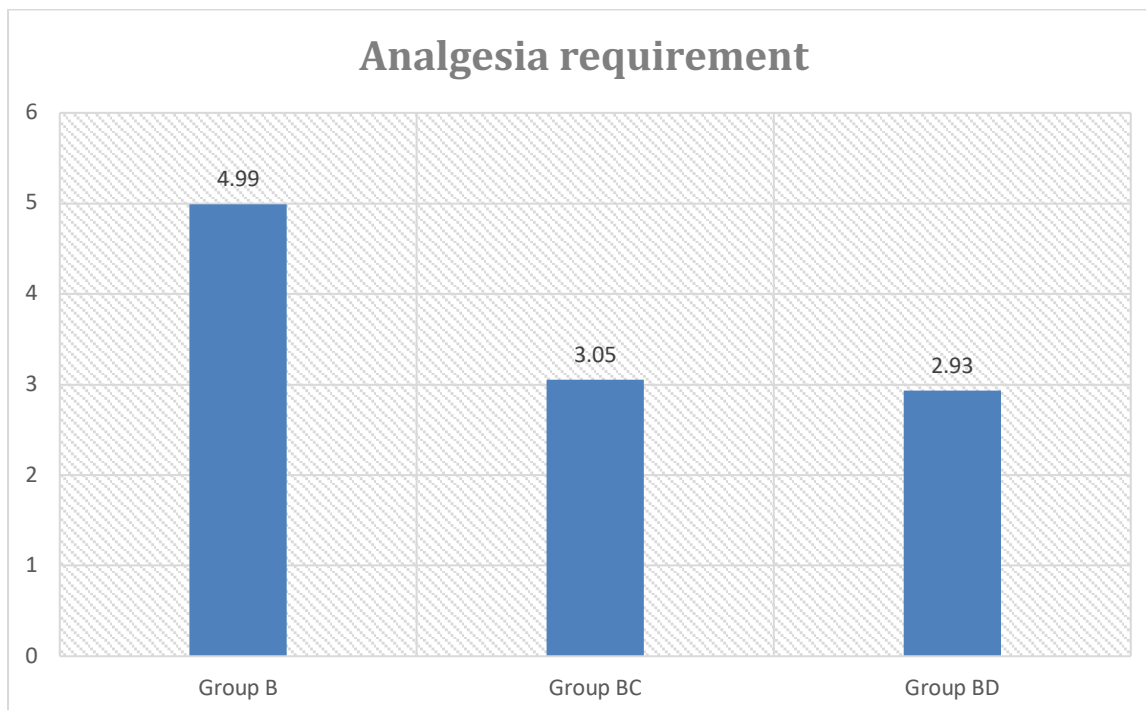
Graph 2: Mean Systolic blood pressure



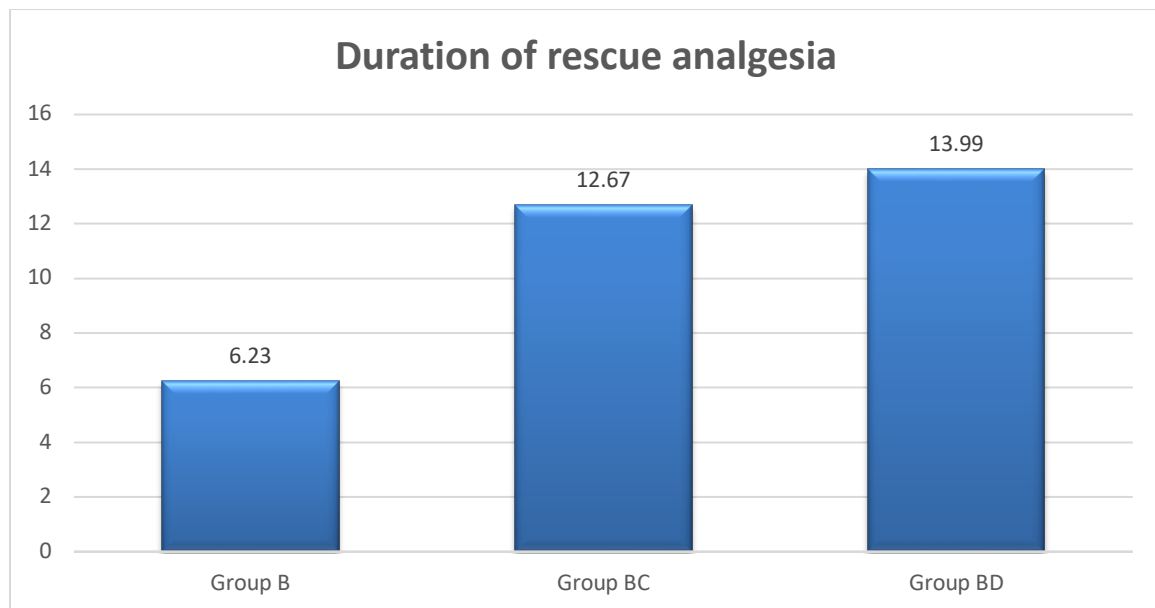
Graph 3: Mean diastolic blood pressure

Table 3: Mean VAS score

Duration	Mean VAS score			
	Group B	Group BC	Group BD	P value
At beginning	6.78±2.31	7.20±1.87	7.38±2.37	0.001
At 2 hours	2.02±1.15	1.34±1.14	1.02±1.22	0.001
At 6 hours	3.43±1.27	1.87±1.58	1.79±1.74	0.001
At 12 ours	4.98±1.30	3.46±1.67	3.45±1.92	0.001
At 18 hours	5.44±2.18	3.91±1.74	3.86±2.18	0.001
At 24 hours	5.72±2.49	5.53±1.74	5.82±2.28	0.001



Graph 4: Details of analgesic dose requirement



Graph 5: Duration of rescue analgesia

Discussion

The mean age was 58.38 years, 55.41 years, and 57.89 years for groups B, BC, and BD, respectively. The average weight was 68.67 kg, 68.12 kg, and 66.76 kg, while the average BMI was 27.32 kg/m², 26.14 kg/m², and 25.79 kg/m² in groups B, BC, and BD, respectively. All three study cohorts were primarily male. The predominant classification among patients in all three research cohorts was ASA grade II (Table 1). A study by Chaitalee NL et al. demonstrated that Group B patients receiving a Fascia iliaca compartment block (FICB) with bupivacaine and dexamethasone experienced significantly prolonged post-operative analgesia compared to Group A patients who were administered bupivacaine alone. Nonetheless, both groups exhibited same VAS values for spinal anesthetic placement following 30 minutes of FICB, in addition to comparable patient satisfaction scores. Researchers established that FICB efficiently facilitates appropriate spinal anesthetic setting, and that the incorporation of dexamethasone (8 mg) with bupivacaine for FICB considerably extends the duration of the block and prolongs the interval to the initial rescue analgesia in comparison to bupivacaine alone [9]. Efreem Fenta Alemnew et al. identified a mean age of 37.27 years in group 1 and 36.60 years in group 2, with a higher number of male participants compared to females. The average BMI was 23.27 in group 1 and 23.33 in group 2, with most cases classified as ASA grade I in both groups [10]. Syeda Sana et al. documented 49 instances classified as ASA level I and 41 cases classified as ASA level II among 90 patients undergoing proximal femoral fracture surgery [11]. The mean heart rate, mean arterial pressure, mean systolic blood pressure, and diastolic blood

pressure values were comparable throughout the study groups. The mean differences at 15, 30, 45, 60, and 90 minutes were statistically significant across the study groups (Table 2, Graphs 1, 2, and 3). A study conducted by Efreem Fenta Alemnew et al. observed no statistically significant differences in baseline SBP, DBP, MAP, PR, and SpO₂ between the dexamethasone and saline groups [10]. A study by Syeda Sana et al. observed no significant difference in blood pressure between group 1 (0.25% bupivacaine) and group 2 (0.25% bupivacaine plus 8mg dexamethasone) [11]. A study conducted by Paria et al. including fifty patients scheduled for hip and knee fracture operations saw steady hemodynamic parameters throughout the surgery [12].

The mean VAS score was similar among the three study groups, and the mean difference was statistically significant across the groups (Table 3). The analgesic dosage required was 4.99 in group B, 3.05 in group BC, and 2.93 in group BD (Graph 4). The group treated with bupivacaine plus dexamethasone (13.99 hours) exhibited a longer analgesic effect, followed by Group BC (12.67 hours) and Group B (6.23 hours) (graph 5). Syeda Sana et al. conducted a study that revealed a significant difference in postoperative VAS scores at 8 and 12 hours. The mean difference in VAS scores between group 1 and group 2 was statistically significant [3]. Kumar K et al. conducted a study that indicated a reduction in mean VAS from 7.16 to 1.67 following FICB [13]. A study conducted by Gopal ND et al. evaluated 60 cases, with group 1 receiving bupivacaine alone and group 2 receiving bupivacaine combined with dexmedetomidine. The mean VAS scores recorded were 3.7 for group 1 and 4.3 for group 2 at 5 minutes, and 0.4 for group 1 and 1.9 for group 2 at

15 minutes, respectively. Group B significantly raised their VAS score at 5, 10, and 15 minutes. The average time to rescue analgesia in Group A was 838.3 ± 82.7 minutes, while in Group B it was 461.5 ± 36.6 minutes [14]. According to a study by Suresh Kumar N et al., people who were given Bupivacaine with dexamethasone felt less pain and needed fewer doses of rescue painkillers than people who were given Bupivacaine alone for fascia iliaca compartment block [15]. According to a study by Vasantha Kumar J et al., the average time to rescue analgesia in the 0.25% bupivacaine group (Group B) was 5.81 hours, whereas in the bupivacaine plus dexamethasone group (Group D), it was 15.98 hours.

The average required for rescue analgesia in group B was 25.0 mg, while in group D it was 126.5 mg [16]. A study by Kumie et al. on femur fracture cases handled with FICB observed a reduced VAS score and an extended duration until the initial analgesic request [17]. A study by Williams et al. treated femoral neck fractures using analgesia with paracetamol and opioids (group 1) and standard analgesia with fascia iliaca block (FICB) (group 2). The findings indicated that the VAS score following standard analgesia with FICB was significantly lower than that of standard analgesia alone ($P = 0.001$). In the conventional analgesia group, the VAS score decreased after 15 minutes, although this change was not statistically significant ($P = 0.76$). In patients receiving conventional analgesia in conjunction with FICB, the VAS score decreased within 15 minutes, and the analgesic effect persisted for the full duration of 8 hours [18]. K. C. Cummings 3rd et al. reported that dexamethasone considerably extended the duration of ropivacaine and bupivacaine in the interscalene block [19].

Several studies reported that 0.25% bupivacaine with 8mg Dexamethasone has significant higher perioperative analgesic effect and decreases the need for rescue analgesia than 0.25% bupivacaine alone [10,11,16]. Similarly present study findings showed that 0.25% bupivacaine with dexamethasone has superior efficacy, better operative hemodynamic stability, less requirement of analgesia compared to bupivacaine alone and with clonidine. Further analysis required to focus upon multiple analgesic combinations in the surgical correction of bony fractures,

Conclusion

The combination of 0.25% bupivacaine with 50 mcg clonidine and 8 mg dexamethasone considerably increases the duration of analgesia and decreases the requirement for rescue analgesia as compared to 0.25% bupivacaine alone. The combination of 0.25% bupivacaine with 8mg Dexamethasone provided better analgesic duration

and required less rescue analgesia on the first postoperative day in patients having femoral operations under FICB compared to 0.25% bupivacaine with 50mcg clonidine.

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