

## Original Research Article

**A Prospective Single-Blinded Randomized Comparative Study of Ropivacaine Alone Versus Ropivacaine with Dexamethasone in Adductor Block****Sathish Bobba<sup>1\*</sup>, P. Sravani<sup>2</sup>, Subodh Pasala<sup>3</sup>**<sup>1</sup>Assistant Professor, Department of Anaesthesia, Gandhi Medical College, Secunderabad, Telangana, India<sup>2</sup>Post Graduate, Department of Anaesthesia, Kakatiya Medical College / MGM Hospital, Warangal, Telangana, India<sup>3</sup>Post Graduate, Department of Anaesthesia, Sunshine Hospital, Secunderabad, Telangana, India

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**Abstract**

**Background:** To compare sensory effects of Ropivacaine alone and Ropivacaine along with Dexamethasone in adductor Block for post operative analgesia after lower limb surgeries. **Materials and methods:** A Prospective randomized single-blinded comparative study in 60 patients randomized into two groups with 30 patients in each group who underwent lower limb surgeries and fulfilled our inclusion criteria during the study period. **Results:** In this study there were no statistically significant differences in demographic profile of patients in either group in terms of age, body weight, or gender ratio ( $p > 0.05$ ). Onset is time from completion of injection of study drug to loss of pinprick sensation over L3, L4 dermatomes. Onset of analgesia in Ropivacaine group was  $12 \pm 1.70$  min whereas in Ropivacaine + Dexamethasone group it was  $11.53 \pm 1.66$  min, which was not statistically significant ( $P > 0.05$ ). Duration of analgesia in Ropivacaine group was  $507.96 \pm 149.32$  min whereas in Ropivacaine + Dexamethasone it is  $1082.63 \pm 195.11$  min, which is statistically highly significant ( $P < 0.0001$ ). None of the participants in this study had adverse effects after adductor block. **Conclusion:** We conclude that addition of Dexamethasone to 0.2% Ropivacaine for adductor canal block increases duration of analgesia significantly. But there was no difference in onset of analgesia.

**Keywords:** Ropivacaine, Dexamethasone, Lower limb surgeries.

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**Introduction**

Pain is “an unpleasant sensory or emotional experience associated with actual or potential tissue damage or described in terms of such damage”. It is an unpleasant effect associated with significant psychological and physiological changes during surgery and post-operative period[1]. Regional anaesthetic techniques have specific advantages both for stand alone anaesthesia or as analgesic supplements for intraoperative and postoperative care. An ever increasing demand for regional anaesthesia from patients and surgeons matches the growing realization that regional anaesthesia can provide superior pain management and perhaps improve patient outcomes to meet evolving expectations for ambulatory, cost-effective surgery. Our aging population presents with an increasing range of co-morbidities, demanding a wider choice of surgical anaesthesia options including the use of a variety of regional techniques in conjunction with general anaesthesia to optimize clinical care, while at the same time reducing the risks of complications. Thus, the practice of regional anaesthesia remains an art for many practitioners and consistent success with these techniques often appears to be limited to anaesthesiologists who are regional anaesthesia enthusiasts.

There are many advantages of adductor canal block for patients who underwent lower limb surgeries for analgesia as effective analgesia, awake patient, extended post operative analgesia, early ambulation, minimal number of drugs used so that polypharmacy is avoided

and less incidence of post operative nausea and vomiting. The adductor canal (subsartorial or Hunter’s canal) is an aponeurotic tunnel in the middle third of the thigh extending from the apex of the femoral triangle to the opening in the adductor magnus, the adductor hiatus. It courses between the anterior compartment of thigh and the medial compartment of thigh, and has boundaries as Anteriorly – sartorius, Posteromedially – adductor longus and adductor magnus and Laterally – vastus medialis[3].

Lying on the aponeurosis is the sartorius (tailor’s) muscle. The canal contains the femoral artery, femoral vein, and branches of the femoral nerve (specifically, the saphenous nerve, and thence to the vastus medialis). The relief from pain is the primary aim of anaesthesia. Since the discovery of local anaesthetic drugs, the need for pain relief during surgery without loss of consciousness is appreciated more and more, both by anaesthesiologist and surgeons. In lower limb surgeries regional anaesthesia is a better option for elective as well as emergency procedures. As technique is relatively simple, provides good analgesia for extended hours additives in it are being tried for extended analgesia.

Many drugs have been studied as adjuvants for regional anesthetic techniques. These adjuvants include Epinephrine, Clonidine, Opioids, Ketamine and Midazolam[2]. But all have met with limited success. Because of the limited efficacy or questionable toxicity of previously studied drugs, some investigators have begun to evaluate glucocorticoids as for regional anaesthesia. Known for their anti inflammatory, analgesic, immunosuppressive, and antiemetic properties, these corticosteroids exert their effects by inhibition of phospholipase A 2 as well as changes in cell function induced by glucocorticoid receptor activation. Although these drugs are associated with significant toxicity when administered in large doses for long periods.

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However, the glucocorticoid; Dexamethasone appears to be effective in prolonging the duration of analgesia with the effect being stronger with Ropivacaine. Why dexamethasone would prolong regional anaesthesia is a subject of much discussion and speculation. Steroids induce some degree of vasoconstriction, so one hypothesis is that it acts in a similar manner to epinephrine by reducing local anaesthetic absorption. A more tractable hypothesis holds that dexamethasone may act locally on nociceptive C-fibres (via glucocorticoid receptors) to increase the activity of inhibitory potassium channels, thus decreasing their activity.

Despite concern surrounding 'off label' use of perineural adjuvants, the safety profile of dexamethasone is promising[3]. Additionally, corticosteroids have a long history of safe use in the epidural space for the treatment of radicular pain arising from nerve root irritation and dexamethasone specifically has been studied as an adjuvant to epidural local anaesthetics.

In fact, the use of dexamethasone as an adjunct to local anaesthesia for nerve blocks is discussed in prominent textbooks[4]. Hence in our study Dexamethasone was selected as an adjuvant to Ropivacaine for studying the effectiveness in prolongation of the duration of analgesia. Clinical data of dexamethasone with long-acting plain local anaesthetic alone are not known, while the dexamethasone data with mepivacaine refute the claim of a long duration sensory-selective blockade. In recent supraclavicular block studies the addition of dexamethasone yielded good results[5]. However, there are lacking studies on the efficacy of dexamethasone in adductor canal block and the research has yet to be done in this area.

#### Material and Methods

**Study Design:** A Prospective randomized single-blinded comparative study done in Patients admitted to Sunshine Hospital, Hyderabad for Lower limb surgeries between November 2015 and November 2017. For purpose of this study, a difference of at least 4 hours in duration of analgesic effect between 2 groups is considered significant

#### Inclusion Criteria

18 yr old and above, ASA GRADE 1 and 2 and Patients who underwent elective lower limb surgeries.

#### Exclusion Criteria

Chronic pain requiring daily opioids > 15 mg oral morphine equivalents, Hypersensitivity to amide local anaesthetics, History of hypersensitivity to dexamethasone, Uncontrolled anxiety, Schizophrenia or bipolar disorder, Preexisting nerve damage (sensory or motor) in the extremity to be blocked, Peripheral neuropathy, Significant cardiovascular disease, Uncontrolled diabetes, Renal Impairment (Creatinine > 2.0 mg/dl), Ongoing drug abuse or alcohol abuse, Pregnancy, Patchy or Partial block **and** Coagulation disorders. In order to detect this difference, required sample size is 26 at 5% (0.05) level of significance and 80% power of test. A total of 60 patients were enrolled in study to arrive at 52 evaluable cases, 30 in each group assuming a drop out of 15% either due to incomplete data or lower enrollment. The patients were randomised into 2 groups based on computer based randomisation containing 30 patients each after approval for study and written informed consent.

Group R – 20 ml of Ropivacaine 0.2% + 2ml Normal Saline

Group RD – 20 ml of Ropivacaine 0.2% + 2ml (8mg) dexamethasone.

The anaesthesia machine, emergency oxygen source, pipeline O<sub>2</sub> supply, working laryngoscope appropriate size endotracheal tubes and connectors, working suction apparatus with suction catheter, Airways (oropharyngeal), Intravenous fluids

Anesthetic agents: Thiopentone, ketamine, diazepam, succinylcholine  
Resuscitation drugs: Hydrocortisone, atropine, adrenaline, aminophylline, mephentermine, calcium gluconate, sodium bicarbonate and IV lipid emulsion.

The site and side is clearly marked, the patient is monitored, IV access obtained and appropriate assistance, equipment and resuscitation drugs availability is ensured.

**Procedure:** With the patient in the proper position, the skin is disinfected and the transducer is placed anteromedially, color doppler scanning is used to trace the femoral artery caudally from the inguinal crease. Once the femoral artery is identified, the needle is inserted in-plane in a lateral-to-medial orientation, and advanced toward the femoral artery. Once the needle tip is visualized medial to the artery and after careful aspiration, 1 to 2 mL of local anaesthetic is injected to confirm the proper injection site. When injection of the local anaesthetic does not appear to result in its spread beside the femoral artery, additional needle repositions and injections may be necessary. After confirming the position of the needle 20ml of 0.2% Ropivacaine with or without dexamethasone will be injected.



Fig. 1: USG probe placement in Adductor canal block

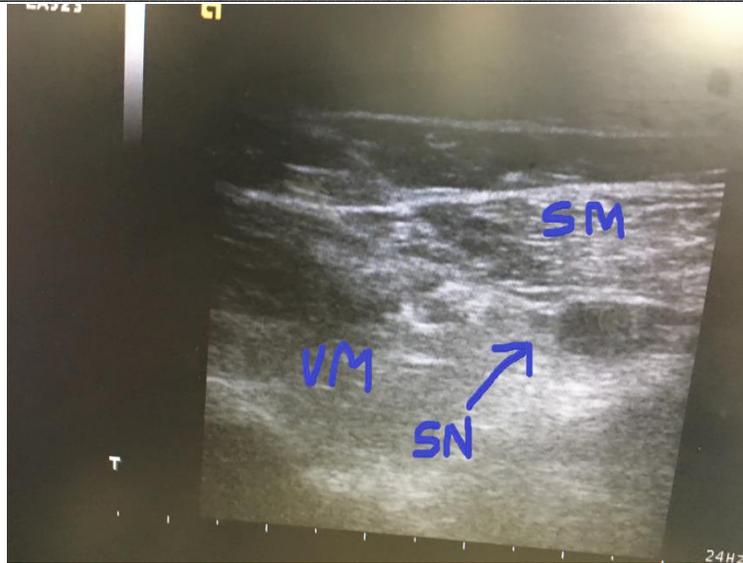


Fig. 2: Ultrasound image showing Saphenous nerve(SN) in Adductor canal.

SM: Sartorius muscle, VM:Vastus medialis muscle

After the block was given, patient was evaluated for onset of sensory block and duration of analgesia, side effects and complications.

Assessment was done every 3 minute till development of sensory block. Other variables that will be demographic data recorded.

Table 1: Verbal Rating Score[6]

Pain Intensity	Score
No pain	0
Mild	1
Moderate	2
Severe	3
Very severe	4

**Statistical Methods**

Continuous variables (age, weight) were presented as Mean ± SD. Categorical variables (sex, complications) were expressed in actual numbers and percentages. Continuous variables were compared between the two groups by performing un-paired t-test. Categorical variables were compared by performing Chi-Square test. Statistical software OPEN EPI was used for data analysis.

P value of > 0.05 – Statistically not significant.  
 P value of < 0.05 – Statistically significant.  
 P value of < 0.01 – Statistically highly significant.  
 P value of < 0.001 – Statistically very highly significant.

**Results**

Table 3: Demographic characteristics of study population

Variable	Ropivacaine	Ropivacaine + Dexamethasone	P VALUE
Age (Years)	61.23±8.16	61.77±7.55	0.791
Sex (M/F)	18(60%)/12(40%)	20(66.6%)/10(33.3%)	0.592
Weight (kg)	64.63±7.08	66.9±6.77	0.209

There were no statistically significant differences in demographic profile of patients in either group in terms of age, body weight, or gender ratio (p > 0.05).The average age was 61.23±8.16 years in R

group and 61.77±7.55 years in RD group. Average body weight 64.63±7.08 kg in R group and 66.9±6.77 kg in RD group. Both the groups had predominantly male patients.

Table 4: Age wise distribution of study population

Age (in years)	Ropivacaine		Ropivacaine+Dexamethasone	
	No	%	No	%
41-50	4	13.33%	3	10%
51-60	8	26.66%	11	36.66%
61-70	14	46.6%	12	40%
71-80	4	13.3%	4	13.33%
<b>Total</b>	<b>30</b>	<b>100%</b>	<b>30%</b>	<b>100%</b>

Table 5: Weight wise distribution of study population

Weight (in kg)	Ropivacaine		Ropivacaine+Dexamethasone	
	No	%	No	%
50 – 60	9	30%	7	23.3%
61 – 70	12	40%	16	53.3%
71 – 80	9	30%	7	23.3%
<b>Total</b>	<b>30</b>	<b>100%</b>	<b>30</b>	<b>100%</b>

**Table 6: ASA grading of study population**

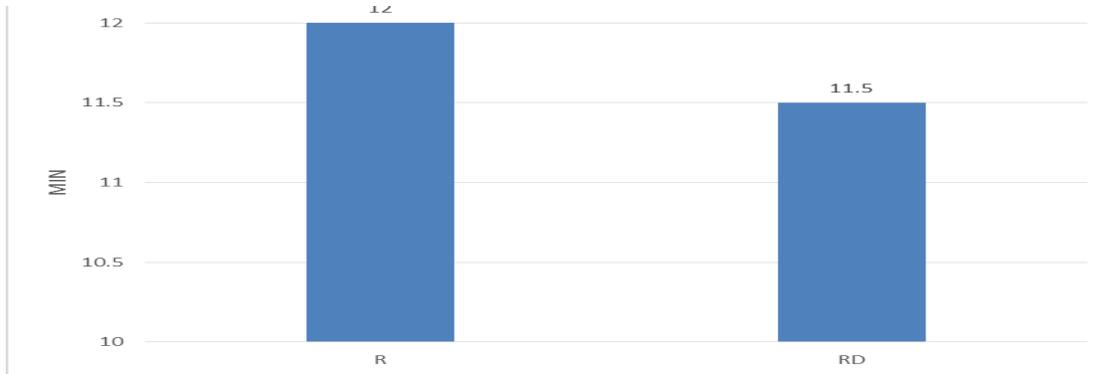
ASA Grade	Ropivacaine		Ropivacaine+Dexamethasone	
	No	%	No	%
1	23	76.6%	23	76.6%
2	7	23.3%	7	23.3%
<b>Total</b>	30	100%	30	100%

There was no significant difference between 2 groups in terms of ASA grading (P=1.000)

**Table 7: Onset of Analgesia**

	Ropivacaine (min)	Ropivacaine+Dexamethasone (min)	P value
Onset of analgesia	12 ± 1.70	11.53 ± 1.66	0.283

Onset of sensory block in Ropivacaine group was 12 ± 1.70 min whereas in Ropivacaine + Dexamethasone group it was 11.53 ± 1.66 min, which was not statistically significant (P > 0.05)

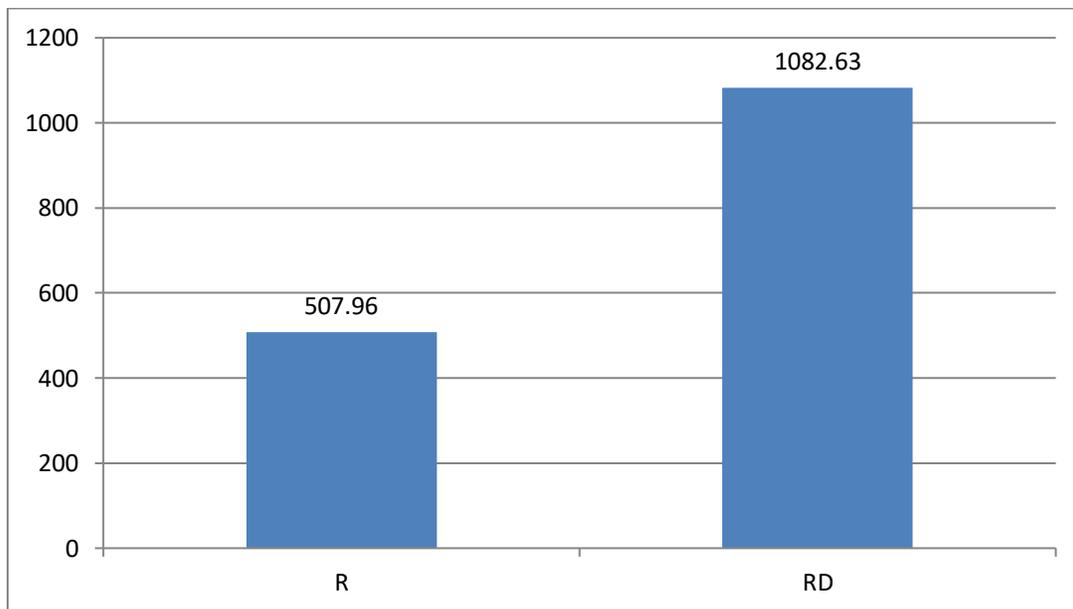


**Fig. 7: Onset of Analgesia**

**Table 8: Duration of analgesia of study Population**

	Ropivacaine	Ropivacaine + Dexamethasone	P value
Duration of analgesia	507.96 ± 149.32	1082.63 ± 195.11	<0.0001

Duration of analgesia in Ropivacaine group was 507.96 ± 149.32 min whereas in Ropivacaine + Dexamethasone it is 1082.63 ± 195.11 min, which is statistically highly significant (P < 0.0001).



**Fig. 8: Comparison of duration of analgesia between 2 groups**

**Discussion**

A Clinical study entitled “A prospective single-blinded randomized comparative study of ropivacaine alone versus ropivacaine with dexamethasone in adductor block for post operative analgesia” was undertaken in Sunshine Hospitals, Hyderabad to compare onset of

analgesia and duration of analgesia between 2 groups. In recent years, there has been a growing interest in the practice of regional techniques and, in particular, peripheral nerve blocks for surgical anaesthesia and postoperative analgesia. The development of local anaesthetic agents with lower toxicity and long duration of action had

contributed to this change. After going through the relevant literature regarding the use of Dexamethasone as an adjuvant to local anaesthetics, it was hypothesised that addition of Dexamethasone to Ropivacaine for adductor canal block, will be effective in prolonging the duration of analgesia for post operative patients.

In our study, the drugs selected for adductor canal block were Ropivacaine and Dexamethasone. Bupivacaine and Ropivacaine are being regularly used for adductor block for post operative analgesia after lower limb surgeries in our hospital. Ropivacaine has a higher toxic threshold, produces less cardiac and central nervous system effects compared to Bupivacaine and hence selected as the local anaesthetic for our study[4].

In an attempt to increase the duration of post-operative analgesia, various adjuvant drugs are used along with local anaesthetic agents. Adjuvants include Epinephrine, Clonidine, Opioids, Ketamine and Midazolam[2]. But all have met with limited success and also there is also an increase in the incidence of side effects. Dexamethasone, as an adjuvant appears to be effective in prolonging the duration of analgesia of adductor block, with the effect being stronger with Ropivacaine.

Despite concern surrounding 'off label' use of perineural adjuvants, the safety profile of dexamethasone is promising. Additionally, corticosteroids have a long history of safe use in the epidural space for the treatment of radicular pain arising from nerve root irritation and dexamethasone specifically has been studied as an adjuvant to epidural local anaesthetics[7,8].

In fact, the use of dexamethasone as an adjunct to local anaesthesia for nerve blocks is discussed in prominent textbooks. Hence in our study Dexamethasone was selected as an adjuvant to Ropivacaine for studying the effectiveness in prolongation of the duration of analgesia.

In our study 0.2% of Ropivacaine was used as high concentrations of local anesthetic like 0.5% or 0.7% Ropivacaine may delay patient ambulation if local anesthetic spreads to one of the motor branches of the femoral nerve serving the quadriceps muscle[8]. In our study 20ml of 0.2% Ropivacaine was chosen, keeping in mind that it should not exceed the safe dose of 3ml/kg body weight. Dexamethasone 8mg was selected as all literature available used 8mg as dose in their study.

In our study onset of sensory block in Ropivacaine group was 12±1.70 min and in Ropivacaine + Dexamethasone group it was 11.53±1.66 which was not statistically significant

However in the study conducted by CUN-JIN WANG et al<sup>9</sup> onset of analgesia is not been documented. Hence we cannot compare our findings with that study.

In our study the duration of analgesia in Ropivacaine group was 507.96 ±149.32min whereas in Ropivacaine + Dexamethasone it is 1082.63±195.11min which was statistically highly significant. In the study conducted by CUN-JIN WANG et al there was statistically highly significant difference in the duration of analgesia between Ropivacaine and Ropivacaine + Dexamethasone group. Hence our study concurs with the above mentioned study in respect to duration of analgesia[9].

The incidence of adverse events in either group was nil. As care was taken not to exceed safety margin of Ropivacaine which was 3mg/kg body weight, hemodynamic parameters like Pulse, Blood pressure and Spo2 were stable in study population without requiring any intervention.

### Conclusion

From our study we conclude that addition of Dexamethasone to 0.2% Ropivacaine for adductor canal block increases duration of analgesia significantly. But there was no difference in onset of analgesia.

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