Section: Anaesthesiology

Original Research Article

A PROSPECTIVE RANDOMISED COMPARATIVE ULTRASOUND GUIDED CLINICAL STUDY OF 20ML OF 0.5%ROPIVACAINE WITH 2MLOF 8MG DEXAMETHASONE AND 20ML OF 0.5%ROPIVACAINE WITH 2ML OF 7.5% SODIUM BICARBONATE IN POPLITEAL NERVE BLOCK IN ANKLE AND FOOT SURGERIES

R. Sindhuja[1], S. Srinath[2], S. Bharat Kumar[3],T.Ravi[4], P. Lokes[5]

[1]Senior Resident, Modern Government Maternity Hospital (MGMH) Petlaburj, Osmania Medical College, Hyderabad, Telangana, India.
[2]Assistant Professor, Department of Anaesthesiology, MGMH, Petlaburj. Osmania Medical College, Hyderabad, Telangana, India.
[3]Assistant Professor, Department of Anaesthesiology, MGMH Petlaburj, Osmania Medical College, Hyderabad, Telangana, India.
[4]Professor, Department of Anaesthesiology. Government Medical College, Khammam, Telangana, India.
[5]Associate Professor, Department of Anaesthesiology, Government Medical College, Medak, Telangana, India.

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Corresponding Author:
Dr.P. Lokesh
Associate Professor, Department of Anaesthesiology, Government Medical College, Medak, Telangana, India.
Email: drlokesh.anae6@gmail.com

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ABSTRACT

Background: To study and compare the clinical efficacy of 20ml of 0.5% ropivacaine with 2ml of 8mg dexamethasone and 20ml of 0.5% ropivacaine with 2ml of 7.5% sodium bicarbonate for popliteal nerve block in relation to.

Material & Methods: The study was a hospital based prospective, randomized clinical study conducted on in patients undergoing ankle and foot surgeries, conducted at the department of Anaesthesia in Virinchi Hospitals, Banjara hills, Hyderabad from April 2021- September 2022. After obtaining the Institutions' Ethical committee's approval 60 patients in age group of 20-60yrs, ASAI,II or III, who were scheduled for ankle and foot procedures were enrolled in this randomized control study. The subjects were randomized in to two study groups, Group S and Group M. Randomisation was done by simple sealed envelope method.

Results: The first Group S was to receive Inj Ropivacaine 0.5% 20ml with Inj Sodium bicar- bonate7.5%2ml.The second Group M was to receive a combination of Inj Ropivacaine 0.5% 20 ml with 8 mg Inj Dexamethasone 2ml. Anaesthetic management was standardized and vitals were monitored intra-operatively. Post-operatively, patients were observed for 24hours. Pain score and side effects, if any were noted. Pain assessment was done every 2nd hourly and incase, VAS exceeded 4 patients were giv- en rescue analgesia. Once all data was collected, statistical comparison was done. In our study we found that Group S patients who received Sodium bicarbonate as ad- dative provided faster onset of sensory and motor level blockage with mean time of onset value being 12.73±1.33(in mins) and 16.13±1.59 (in mins) respectively com- pared to Group M where mean value was 16.83±1.66(in mins) 24.37±1.40(in mins). The results were statistically significant with a p value of <0.001**.The duration of sensory level block and motor block in Group M who received Dexamethasone as additive was longer with mean values being17.96±1.95(in hours) and10.35±0.81(in hours) respectively compared to Group S where mean value was 13.48±1.29(in hours) and 7.43±0.88(in hours) with statistically significant p value of <0.001**.VAS was assessed at intervals of 30 mins, at 2hrs, at 4hrs, at 6hrs, at 8hrs, at 12hrs and at 24hrs. Up to 6 hours after surgery VAS did not

differ much in the two groups, however mean VAS at 8 hours after surgery was lesser for Group M compared to Group S with statistically significant p value of 0.002**. The values were similar at 10 hours after surgery as well.
Conclusions: The study concluded that Sodium bicarbonate as an additive to LA helps in rapid onset of sensory and motor block with no adverse effects noted and dexamethasone as an adjunct to LA not only increases the duration of sensory and motor block but also provides good post-operative analgesia Popliteal nerve block is an excellent alternative to neuraxial blockade and an effective technique for anaesthesia and analgesia for ankle and foot surgeries. Hence Its indication in head injury patients makes it an ideal anaesthetic technique. It results in prolonged and high quality analgesia with excellent comfort, success rate and decreased adverse events.
Keywords: Dexamethasone, LA, VA, Popliteal nerve block, Ankle foot surgeris.

INTRODUCTION

The effectiveness of anaesthesia techniques has an important role in increasing the ambulatory orthopaedic and surgical procedures. Regional anaesthesia techniques are used
frequently as an alternative to general anaesthesia in these procedures.[1]Foot and ankle surgery is accompanied by pain for the first few days following surgery, opioid based post-operative pain management can lead to inadequate pain relief and is accompanied by side effects.[1] Popliteal nerve block is a useful technique for ankle and foot surgeries, particularly in patients thought unsuitable for central neuraxial block. It also avoids complications in the elderly patients who are particularly prone for haemodynamic changes leading to increased morbidity and mortality. It is also associated with added advantage of early postoperative mobility which is essential for surgeries. Another advantage of popliteal nerve block over central neuraxial block is its avoidance of post dural puncture headache, making it an ideal technique for ambulatory surgeries. It may also be used more readily after head injury where central neuraxial block is relatively contraindicated.
Long acting local anaesthetics (LA) are commonly used for popliteal nerve block as they provide prolonged post-operative analgesia and ropivacaine is the most commonly used LA for this purpose. The analgesic duration after peripheral nerve blockade with ropivacaineislongerthan,[2]or the same3as the duration of analgesia provided by bupivacaine. Furthermore, ropivacaine is less expensive compared to levobupivacaine or bupivacaine. Agents such as dexamethasone and clonidine are used as adjuvants to local anaesthetics in peripheral nerve blockade.[4]
It is proved that the addition of dexamethasone to local anaesthetics for neuraxial anaesthesia improves the quality of analgesia and prolongs the duration of anaesthesia4. Decreased nociceptive C-fibre activity via a direct effect on glucocorticoid receptors and inhibitory potassium channels is probably the mechanism of action of dexamethasone.[5]
The present study is taken up to compare the clinical efficacy of 20 ml of 0.5% ropivacaine with 2ml of 8mg dexamethasone and 20ml of 0.5% ropivacaine with 2ml of 7.5% sodium bicarbonate for popliteal nerve block.

IMSANDOBJECTIVES

To study and compare the clinical efficacy of 20ml of 0.5% ropivacaine with 2ml of 8mg dexamethasone and 20ml of 0.5% ropivacaine with 2ml of 7.5% sodium bicarbonate for popliteal nerve block in relation to:

Primary Objectives

To compare 0.5% Ropivacaine with 2ml of 8mg Dexamethasone and 0.5% Ropivacaine with 2mlof7.5% Sodium Bicarbonate in popliteal nerve block for ankle and foot surgeries with respect to :

1. Onset and duration of sensory blockade
2. Onset and duration of motor blockade
3. Total rescue analgesia consumptionwithin24 hours

Secondary Objectives

1. Haemodynamic parameters
2. Any other side effects
3. Patient and surgeon satisfaction.

MATERIALS AND METHODS

After obtaining institutional ethical committee clearance, 60 adult patients aged between 18 – 70 years of either sex with ASA physical statusI, II and III, posted for ankle and foot surgeries were grouped randomly into two groups using simple sealed envelope method with30patients in each group. (n=30). An informed consent was obtained from all patients and detailed pre anaesthetic evaluation was done on the previous day of surgery.
All patients were nilper orally for 6 hours for solids and 2 hours for liquids priorto surgery. Tab Alprazolam 0.25mg and Tab Ranitidine 150 mg was given on the previous night of surgery. Anaesthesia machine was checked and all the drugs and equipments necessary for emergency resuscitation was kept ready. On receiving the patient in operating room, a wide bore intravenous line was secured with 18 gauge (G) cannula.
Monitoring for electrocardiography (ECG), heart rate(HR), arterial pulse saturation (SpO2) and non invasive blood pressure(NIBP) was done for all patients.

The sciatic nerve is considered a nerve bundle with two separate nerves: tibialand common peroneal. These two components eventually diverge 5–12 cm proximal to the crease of the popliteal fossa. We could block the sciatic nerve under ultrasound guidance within the common epineural sheath and proximal to the terminal division through a posterior approach. The patient was placed in the prone position with the foot protruding off the operating bed. This technique involves the detection of a point1cm lateral to the centre of the popliteal fossa and 7–8 cm above the popliteal crease06. After infiltrating the skin with 1% lidoocaine popliteal nerve injection was performed. The nerve was visualized under ultrasound guidance and 5cm insulated needle attached to peripheral nerve stimulator with the initial intensity of current set at 2mA. Palpable or visible twitches of the foot ortoes at 0.2–0.5mAcurrent was our target. Either dorsiflexion and eversion or plantar flexion and inversion were accepted responses. If the evoked response persisted at 0.2 mA, the needle was slightly with drawn until the response was maintained between 0.2 and 0.5 mA06.

After negative aspiration for blood, test solution (20ml of 0.5% ropivacaine with either 2ml of8mg dexamethasone or 7.5% Sodium Bicarbonate 2ml) was injected. Time of completion of injection was taken as time zero. Test drug was prepared and loaded in two 10mlsyringes with one syringe having either 2 ml of 8mg dexamethasone or 7.5%SodiumBicarbonate2ml by ananaesthesiologist who is not involved in the study. All the blocks was performed by the same investigator.

Immediately following popliteal nerve block patients were placed in supineposition.Sensory block was assessed by pin prick test using 27G blunt needle every,[5] minutes forthe onset of block on the dorsal and plantar aspects of the foot and sensation was categorised as,[7]

0=sharp (normal sensation as of contra lateral limb)
1=dull (pin prick perceived as pressure)
2=absent (complete loss of awareness of pin prick)

Motor block was assessed every5 minutes for the onset by assessing plantaror dorsi-flexion at the ankle and was graded as,[7]

0=normal power 1=reduced power 2=complete motor block

Onset of sensory and motor block, duration of blocks, quality of block and will be observed and noted.

Patients were assessed for haemodynamic parameters every5 minutes till the complete onset and also at the end of surgery. Patients were monitored for any signs and symptoms of cardiovascular(changes in heart rate,rhythm)and central nervous system toxicity. They were also monitored for signs of hypersensitivity reactions to local anaesthetic drugs. Patient satisfaction with the anaesthetic technique was recorded by asking the patient and surgeon to assess the block as : very good, good, medium or poor. In the post-operative period, the pain was assessed by Visual Analogue Score and at a score of >4, patients were given analgesics like inj. Tramadol 50mg or inj. Diclofenac 75mg and the study concluded at this point.

Statisticalmethods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%).Significance is assessed at 5%level of significance.

RESULTS

DEMOGRAPHICDATA

Seventytwo patients were assessed for study, eight did not meet the inclusioncriteria and 4 declined the block. 60 patients of either sex, belonging to ASA I , ASAII and ASA III undergoing elective ankle and foot surgeries were included in the study. All the patients were administered popliteal nerve block and were randomised into two groups: GROUP M and GROUP S , to receive either 20mlofInj Ropivacaine 0.5% with2ml of 8mg dexamethasone or20ml of Inj Ropivacaine 0.5%with 2ml7.5% Sodium Bicarbonate respectively. There were no statistically significant differences between these groups in demographics, ASA grading and the type of surgeries.

Table 1: Age distribution of patients studied Samples are age

Ageinyears	GroupS	GroupM	Total
<20	1(3.3%)	0(0%)	1(1.7%)
20-30	3(10%)	3(10%)	6(10%)
31-40	7(23.3%)	3(10%)	10(16.7%)
41-50	4(13.3%)	9(30%)	13(21.7%)
51-60	7(23.3%)	7(23.3%)	14(23.3%)
61-70	7(23.3%)	7(23.3%)	14(23.3%)
>70	1(3.3%)	1(3.3%)	2(3.3%)
Total	30(100%)	30(100%)	60(100%)
Mean± SD	48.70±14.69	50.70±13.80	49.70±14.17

Table 2: Gender distribution of patients studied Samples are gender matched with P=0.273, Chi-Square test

Gender	Group S	Group M	Total
Female	8(26.7%)	12(40%)	20(33.3%)
Male	22(73.3%)	18(60%)	40(66.7%)
Total	30(100%)	30(100%)	60(100%)

Table 3: Weight (kg) distribution in two groups of patients studied P=0.546, Not Significant, Student t test

Weight(kg)	Group S	Group M	Total
50-60	13(43.3%)	9(30%)	22(36.7%)
61-70	10(33.3%)	12(40%)	22(36.7%)
71-80	7(23.3%)	9(30%)	16(26.7%)
Total	30(100%)	30(100%)	60(100%)
Mean± SD	64.40±7.93	65.60±7.35	65.00±7.60

Table 4: ASA Grade distribution in two groups of patients studied P=0.958, Not Significant, Chi-Square Test

ASA Grade	Group S	Group M	Total
I	5(16.7%)	5(16.7%)	10(16.7%)
II	16(53.3%)	15(50%)	31(51.7%)
III	9(30%)	10(33.3%)	19(31.7%)
Total	30(100%)	30(100%)	60(100%)

Table 5: Surgery distribution in two groups of patients studied

Surgery	GroupS	GroupM	Total
Fasciotomy	5(16.7%)	8(26.7%)	13(21.7%)
Debridement	5(16.7%)	5(16.7%)	10(16.7%)
Anklearthroscopy	3(10%)	4(13.3%)	7(11.7%)
K-wiring	4(13.3%)	3(10%)	7(11.7%)
Disarticualtion	4(13.3%)	2(6.7%)	6(10%)
TendonRepair	3(10%)	3(10%)	6(10%)
Raysamputation	5(16.7%)	1(3.3%)	6(10%)
Excision	0(0%)	3(10%)	3(5%)
Forefootamputation	1(3.3%)	1(3.3%)	2(3.3%)
Total	30(100%)	30(100%)	60(100%)

PRE-OPERATIVEVITALS

The mean heart rate in Group S was 93.60±11.11 and Group M was 86.20±6.71. This was found to be statistically significant, with a p value of 0.003**. The mean SBP in Group S was 138.67±22.97 and Group M was 140.80±22.44. This was found to be statistically insignificant, with a p value of 0.717. The mean DBP in Group S was 89.33±17.63 and Group M was 90.73±14.81.This was found to be statistically in-significant, with a p value of 0.740.

The mean spO2 in Group L was 99.50±0.90 and Group B was 99.67±0.55. This was found to be statistically insignificant, with a p value of 0.381.

Table 6: Comparison of pre-operative vitals in two groups of patients studied

Variables	Group S	Group M	Total	P value
HeartRate	93.60±11.11	86.20±6.71	89.90±9.84	0.003**
SBP(mmHg)	138.67±22.97	140.80±22.44	139.73±22.54	0.717
DBP(mmHg)	89.33±17.63	90.73±14.81	90.03±16.16	0.740
Spo2	98.50±0.90	98.67±0.55	98.58±0.65	0.381

POST-OPERATIVEVITALS

The mean heart rate in Group S was 89.60±10.65 and Group M was 81.27±5.98. This was found to be statistically significant, with a p value of <0.001**. The mean SBP in Group S was 126.73±23.51 and Group M was 131.53±23.66. This was found to be statistically insignificant, with a p value of 0.434.The mean DBP in Group S was 81.48±14.68 and Group M was 85.13±12.56.This was found to be statistically in-significant, with a p value of 0.316

The mean spO2 in Group L was 98.30±0.90 and Group B was 98±0.80. This was found to be statistically insignificant, with a p value of 0.177.

Table 7: Comparison of post-operative vitals in two groups of patients studied

Variables	Group S	Group M	Total	P value
Heart Rate	89.60±10.65	81.27±5.98	85.43±9.54	<0.001**

SBP(mmHg)	126.73±23.51	131.53±23.66	129.13±23.51	0.434
DBP(mmHg)	81.48±14.68	85.13±12.56	83.40±13.61	0.316
Spo2	98.30±0.90	98±0.80	98.05±0.74	0.177

SENSORYLEVELBLOCKAGE

Sensory level blockage was compared for patients in both the groups, at time intervals of 5 mins, 10 mins, 15 mins, 20mins, 25mins and 30mins after administration of the block. The values were statistically significant at levels L5-S2.Almost similar levels of sensory blockage was attained by both groups at a given time interval.

The time of onset of sensory level block in Group S was 12.73±1.33 (in mins) and in Group Mwas16.83±1.66 (in mins).The results were statistically significant with a p value of <0.001**. Hence we can conclude that patients in Group S had statistically significant faster onset of sensory blockage when compared to Group M. The duration of sensory level block in Group S was13.48±1.29 (in hours) and in Group M was17.96±1.95 (in hours).The results were statistically significant with a p value of<0.001**.With this result we can conclude ethat patients in Group M had statistically significant more duration of sensory block when compared to Group S.

Table 8: Sensory Level blockage distribution in two groups

Sensory level blockage (in mins)	Group S (n=30)	Group M (n=30)	Total (n=60)	Pvalue
L4				
6-10	23 (76.66%)	18(60%)	41(68.33%)	
11-15	7 (23.33%)	12(40%)	19 (31.66%)	0.2668
16-20	0	0	0	
L5				
6-10	22 (73.33%)	12 (40%)	34 (56.66%)	
11-15	8 (26.66%)	18 (60%)	26(43.33%)	0.0182
16-20	0	0	0	
S1				
6-10	15 (50%)	1(3.33%)	16 (26.66%)	
11-15	14 (46.66%)	28 (93.33%)	42(70%)	0.001
16-20	1(3.33%)	1(3.33%)	2(3.33%)	
S2				
6-10	0	0	0	
11-15	29 (96.66)	8 (26.66%)	37 (61.66%)	0.001
16-20	1(3.33%)	22 (73.33%)	23 (38.33%)	

Table 9: Time of Onset of sensory block-distribution in two groups of patients studied

Onset of sensory block (in mins)	Group S (n=30)	Group M (n=30)	Total (n=60)	P value
• 6-10	0	0	0	0.0001
• 11-15	29(96.66%)	8(26.66%)	37(61.66%)	
• 16-20	1(3.33%)	22(73.33%)	23(38.33%)	

Table 10: Time of Onset of sensory block- comparison in two groups of patients studied

	Group S	Group M	Total	P value
Onset Sensory Block in mins	12.73±1.33	16.83±1.66	14.76±2.51	<0.001**

Table 11: Duration of sensory Block in hrs – distribution in two groups of patients studiedP<0.001,Significant, Fisher Exact Test**

Duration of sensoryBlock in hrs	Group S	Group M	Total
<12	2(6.9%)	0(0%)	2(3.4%)
12-24	27(93.1%)	29(100%)	56(96.6%)
>24	0(0%)	0(0%)	0(0%)

Total	29(100%)	29(100%)	58(100%)

Table12: Duration of sensory Block in hrs – comparison in two groups of patients studied

	Group S	Group M	Total	P value
Duration of SensoryBlock in hours	13.48±1.29	17.96±1.95	15.75±2.79	<0.001**

MOTORLEVELBLOCKAGE

After administering popliteal nerve block motor block was assessed using BRO- MAGE SCALE in all the patients. Motor Block was assessed at30 minutes,2hours,4 hours,6hours, 8 hours and 12 hours post operatively. Group M showed more motor blockage compared to Group S at all the above mentioned time intervals post operatively with all of them being statistically significant (p value <0.001**) except at 2 hours (p value = 0.112). With this result we can conclude that patients in Group M had statistically significant more motor blockage when compared to Group S.

The time of onset of motor block in Group S was 16.13±1.59 (in mins) and in Group M was 24.37±1.40 (in mins) . The results were statistically significant with p value <0.001**. Hence we can conclude that patients in Group S had statistically significant faster onset of motor blockage when compared to Group M. The duration of motor level block in Group S was 7.43±0.88 (in hours) and in Group M was 10.35±0.81 (in hours) . The results were statistically significant with a p value of <0.001**. With this result we can conclude that patients in Group M had statistically significant more duration of motor block when compared to Group S.

Table 13: Motor blockage (Bromage scale) –distribution in two groups of patients studied

Motorblockage (Bromagescale)	GroupS (n=30)	GroupM (n=30)	Total (n=60)	Pvalue
30MINS				
• 0	0(0%)	0(0%)	0(0%)	<0.001**
• 1	0(0%)	0(0%)	0(0%)	
• 2	0(0%)	24(80%)	24(40%)	
• 3	29(96.7%)	5(16.7%)	34(56.7%)	
2 HOURS				
• 0	0(0%)	0(0%)	0(0%)	0.112
• 1	0(0%)	0(0%)	0(0%)	
• 2	4(13.3%)	0(0%)	4(6.7%)	
• 3	25(83.3%)	29(96.7%)	54(90%)	
4 HOURS				
• 0	1(3.3%)	1(3.3%)	2(3.3%)	<0.001**
• 1	0(0%)	0(0%)	0(0%)	
• 2	24(80%)	4(13.3%)	28(46.7%)	
• 3	5(16.7%)	25(83.3%)	30(50%)	
6 HOURS				
• 0	0(0%)	0(0%)	0(0%)	<0.001**
• 1	18(60%)	0(0%)	18(30%)	
• 2	11(36.7%)	29(96.7%)	40(66.7%)	
• 3	0(0%)	0(0%)	0(0%)	
8 HOURS				
• 0	19(63.3%)	1(3.3%)	20(33.3%)	<0.001**
• 1	11(36.7%)	29(96.7%)	40(66.7%)	
• 2	0(0%)	0(0%)	0(0%)	
• 3	0(0%)	0(0%)	0(0%)	

Table 14: Motor blockage (Bromage scale)-Comparison in two groups of patients studied

Motor blockage (Bromage scale)	Group S	Group M	Total	P value
30mins	3.00±0.00	2.17±0.38	2.59±0.50	<0.001**

2hours	2.86±0.35	3.00±0.00	2.93±0.26	0.039*
4hours	2.10±0.55	2.77±0.63	2.43±0.67	<0.001**
6hours	1.38±0.49	2.00±0.00	1.69±0.47	<0.001**
8hours	0.37±0.49	0.97±0.18	0.67±0.48	<0.001**
12 hours	0.00±0.00	0.00±0.00	0.00±0.00	-

Table 15: Time of Onset of motor block-distribution in two groups of patients studied

Onset of motor block (in mins)	Group S (n=30)	Group M (n=30)	Total (n=60)	P value
<15	4(13.33%)	0	4(13.33%)	<0.001**
16-20	26(86.66%)	0	26(86.66%)	
>20	0	30(100%)	30	

Table 16: Time of Onset of motor block-comparison in two groups of patients studied Table 16: Time of Onset of motor block-comparison in two groups of patients studied

	Group S	Group M	Total	P value
Onset of MotorBlock in mins	16.13±1.59	24.37±1.40	20..25±4.40	<0.001**

Table 17: Duration of motor block in hrs- distribution in two groups of patients studied

Duration of motor block in hrs	Group S	Group M	Total
<8	19(65.5%)	0(0%)	19(32.8%)
8-10	10(34.5%)	13(44.8%)	23(39.7%)
>10	0(0%)	16(55.2%)	16(27.6%)
Total	29(100%)	29(100%)	58(100%)

Table 18: Duration of motor block in hrs- comparison in two groups of patients studied

	Group S	Group M	Total	P value
Duration of MotorBlock in hours	7.43±0.88	10.35±0.81	8.89±1.69	<0.001**

Table 19: Pre-medication in jmidazolam distribution in two groups of patients studied

Pre-medication injmidazolam	Group S	Group M	Total
No	18(60%)	18(60%)	36(60%)
Yes	12(40%)	12(40%)	24(40%)
Total	30(100%)	30(100%)	60(100%)

Table 20: Duration of surgery in mins distribution in two groups of patients studied

Duration of surgery in mins	Group S	Group M	Total
<60	9(30%)	18(60%)	27(45%)
60-90	19(63.3%)	7(23.3%)	26(43.3%)
>90	1(3.3%)	5(16.7%)	6(10%)
Total	30(100%)	30(100%)	60(100%)

Table 21: Inj Propofol distribution in two groups of patients studied

InjPropofol	GroupS	Group M	Total
No	29(96.7%)	27(90%)	56(93.3%)
Yes	1(3.3%)	3(10%)	4(6.7%)
Total	30(100%)	30(100%)	60(100%)

VISUALANALOGSCALE

Visual Analogue Scale was used for post operative pain assessment in all the 60 patients at time intervals of 2hrs, 4hrs, 6hrs, 8hrs, 12hrs and 24hrs. Both the groups had very good post operative analgesia for about 12hrs after surgery. For up to 6 hours after surgery the VAS for both the groups were similar with the values not being statistically significant. VAS was assessed again at 8 hours after surgery where Group S showed a mean VAS of 1.28±0.45and Group M showed a mean VAS of 1.00±0.00. This was statistically significant with a p value of0.002**.At12 hrs after surgery, Group S showed a mean VAS of 1.93±0.37and Group M recorded a mean VAS of 1.07±0.37.This was statistically significant with a p value of <0.001**. However, VAS assessed at 12 hours after surgery for both the groups were not statistically significant.

Table 22: Visual analog scale-Distribution in two groups of patients studied

VisualAnalog Scale	GroupS (n=30)	GroupM (n=30)	Total (n=60)	Pvalue
2Hours				1
● 0	30 (100%)	30 (100%)	60 (100%)	
● 1	0	0	0	
● 2	0	0	0	
4Hours				
● 0	12 (40%)	17 (56.66%)	29 (48.33%)	0.501
● 1	18 (60%)	13 (43.33%)	31 (51.66%)	
● 2	0	0	0	
6Hours				
0	4(13.33%)	7(23.33%)	11 (18.33%)	0.506
1	26 (86.66%)	23 (76.66%)	49 (81.66%)	
2	0	0	0	
8 Hours				
0	0	0	0	
1	22 (73.33%)	30 (100%)	52 (86.66%)	0.0046
2	8(26.66%)	0	8(13.33%)	
12 Hours				
1	0	27 (90%)	27 (45%)	0.0001
2	30 (100%)	3(10%)	33 (55%)	
3	0	0	0	
24 Hours				
2	0	0	0	

Table 23: Visual analog scale-Comparison in two groups of patients studied

Visual analog scale	Group S	Group M	Total	P value
2hour	0.00±0.00	0.00±0.00	0.00±0.00	-
4hour	0.59±0.50	0.41±0.50	0.50±0.50	0.196
6hour	0.87±0.35	0.73±0.45	0.80±0.40	0.203
8hour	1.28±0.45	1.00±0.00	1.14±0.35	0.002**
12hour	1.93±0.37	1.07±0.37	1.50±0.57	<0.001**
24hour	3.13±0.73	2.93±0.58	3.03±0.66	0.246

Table 24: Return of (in hrs)-Comparison in two grouM.ps of patients studied

Return of (in hrs)	Group S	Group M	Total	P value
Plantarflexion of foot	7.45±0.90	10.36±0.82	8.91±1.70	<0.001**
Dorsiflexion of great toe	7.19±0.76	10.09±0.81	8.64±1.66	<0.001**
Proprioception of foot	11.26±1.01	12.98±1.38	12.12±1.48	<0.001**

SIDEEFFECTS

Post-operative nausea and vomiting (PONV), infection, nerve injury, vascular punc- ture, respiratory depression and hypersensitivity were assessed as side effects/ com- plications in patients from both the groups. Three patients each from Group S (3.3%) and Group B(10%) had nausea and vomiting postoperatively. The results were not statistically significant with a pvalue of1.One patient from Group S and two patients from Group M had vascular puncture as a complication, however the results were not statistically significant with a p value of 1.

Table 25: Side effects

	Group S (n=30)	Group M (n=30)	Total (n=60)	P value
Infection	0(0%)	0(0%)	0(0%)	1.000
Nerve injury	0(0%)	0(0%)	0(0%)	1.000
Vascular puncture	1(3.3%)	2(6.7%)	3(5%)	1.000
Respiratory depression	0(0%)	0(0%)	0(0%)	1.000
Hypersensitivity	1(3.3%)	0(0%)	1(1.7%)	1.000
PONV	3(10%)	3(10%)	6(10%)	1.000

DISCUSSION

In the field of anaesthesia there have been drastic changes with respect to inventions of various techniques and anaesthetic drug show ever an effective way to control pain postoperatively has still not been established. Various studies with unexplored techniques are now being done in an attempt to find the best methods for adequate anaesthesia and analgesia. We did a study entitled —"Popliteal Nerve block in patients undergoing ankle and foot surgeries : A prospective randomised ultrasound guided comparative clinical study of 20ml of 0.5% ropivacaine with 2ml of 8 mg dexamethsone and 20mlof 0.5% ropivacaine with 2 ml of7.5% sodium bicarbonate.

In our hospital based prospective, randomized ultrasound guided comparative clinical study conducted on 60 patients undergoing Ankle and Foot surgeries at Virinchi Hospital between the time period from April 2021 – September 2022, we randomised the patients by a simple sealed envelope method into Group S who received 20mlofInj Ropivacaine 0.5% with 2ml 7.5% Sodium Bicarbonate and Group M who received 20ml of Inj Ropivacaine 0.5% with 2ml of 8mg Dexamethasone. Poplitealnerve block for ankle and foot surgeries was found to be anexcellent alternative to General and Spinal anaesthesia in achieving good intra operative conditions, longer post- operative analgesia with minimal adverse events.

Anaesthesia for Ankle and Foot Surgeries

Regional anaesthesia techniques are used frequently as an alternative1 to general anaesthesia in Ankle and Foot surgery. These surgeries are accompanied by pain for the first few days following surgery. Opioid42 based postoperative pain management can lead to inadequate pain relief and is accompanied by side effects43. Popliteal nerve block is a useful technique for ankle and foot surgeries, particularly inpatients thought unsuitable for central neuraxial block. It also avoids complications in the elderly patients who are particularly prone for hemodynamic changes leading to increased morbidity and mortality. The sciatic nerve,[6] is considered a nerve bundle with two separate nerves: tibial and common peroneal. These two components eventually diverge 5–12 cm proximal to the crease of the popliteal fossa.We could block the sciatic nerve within the common epineural sheath and Proximal to the terminal division through a posterior approach.

Studies by Ayman A.ElSayed et al; Singelyn FJ,[7]Gouverneur JM,Gribomont BF et al and R. Arcioni et al,[8] have shown an added advantage of popliteal nerve block in early post-operative mobility which is essential in surgical procedures. It was determined that as safe and reliable alternative to more common forms of anaesthesia for surgery below the knee and popliteal nerve block avoids post dural puncture headache, making it an ideal technique for ambulatory surgeries and can be used more readily after head injury where central neuraxial block is relatively contraindicated

In our study, we used a single,[9] injection posterior approach popliteal nerve block for all the patients posted for ankle and foot surgeries in our study. It increased the patient's comfort and success rate, also decreased the adverse events.

Addition of Sodium bicarbonate

The efficacy of the alkalinised,[11] local anaesthetic solution was showed on quicker onset of anaesthesia and less injection pain not only in peripheral nerve blocks but also in various regional anaesthesia techniques such as intraoral or inferior alveolar nerve blocks. However, keeping a mixture of LAs and bicarbonate for more than20 min, or anexcessive addition of bicarbonate may cause precipitation, and therefore injection of'free base' with particles reducing bioavailability and anaesthetic activity. Kosucu,Muge& Ulusoy, Hulya & Erciyes, Nesrin&Topbas,Murat&Turhan,Ahmet10showed that addition of 8.4% sodium bicarbonate to the syringe at the precise moment of the procedure in specific concentrations and proportions before the regional technique is performed will not precipitate the drug.

Keeping this in mind we used7.5% sodium bicarbonate added to0.5% ropivacaine immediately before administering hence avoiding the precipitation of the drug.

Addition of Dexamethasone

According to the traditional theory of steroid action, steroids bind to intracellular receptors and modulate nuclear transcription. Corticosteroids may have a local effect on the nerve. It was found that steroids produce analgesia,[5] by reduction of inflammation by inhibition of Phospholipase A2 by blocking transmission in nociceptive c-fibers and suppressing ectopic neuronal discharge. The effect was reversible, suggesting a direct membrane action of steroids. Steroids might bring about this effect by altering the function of potassium channels in the excitable cells. The dose of dexamethasone as an adjuvant to local anaesthetics for peripheral nerve block has not been described; we used a dose of 8 mg because administration of this dose seems to be safe in adults. Adverse effects with a single dose of dexamethasone are probably extremely rare and minor in nature, and previous studies have demonstrated that short-term (< 24 hours) use of dexamethasone11 was safe.

Santosh Kumar et al. demonstrated that the addition of 8 mg of dexamethasone to 0.5% ropivacaine for supraclavicular brachial plexus prolongs,[12] sensory and motor block as compared ropivacaine given alone.

In accordance to these studies no side effects (like raise in blood sugar levels in diabetics) were noticed in any of the study groups in our patients. Thus additive effects of dexamethasone to Ropivacaine in

the Popliteal nerve block, using ultrasound guided posterior approach produced prolonged sensory and motor blockade and effective postoperative analgesia which lasted longer than that produced by ropivacaine with sodium bicarbonate without any significant side effects. Also it is a very cost effective way of providing analgesia.

Sensory blockage

In our study we found that Group S patients who received Sodium bicarbonate as additive provided faster onset of sensory level blockage with mean time of onset value being 12.73±1.33(in mins) compared to Group M where mean value was 16.83±1.66(inmins). The results were statistically significant with a p value of<0.001**.However the duration of sensory level block in Group M who received Dexamethsone as additive was17.96±1.95(in hours) compared to Group S where mean value was 13.48±1.29(in hours) with statistically significant p value of <0.001**. With this result we can conclude that patients in Group M had statistically significant more duration of sensory block when compared to Group S.

Motor blockage

In our study we found that Group S patients who received Sodium bicarbonate as additive provided faster onset of motor level blockage with mean time of onset value being16.13±1.59 (in mins) compared to Group M where mean value was 24.37±1.40(in mins) .The results were statistically significant with a p value of <0.001**. However the duration of motor level block in Group M who received Dexamethasone as additive was10.35±0.81(in hours) compared to GroupSwhere mean value was7.43±0.88(in hours) with statistically significantp value of <0.001**. With this result we can conclude that patients in Group M had statistically significant more duration of motor block when compared to Group S.

Postoperative pain by VAS

Postoperative pain, was measured by VISUALANALOGUE SCALE at intervals of 30 mins, at 2 hrs, at 4hrs,at 6hrs,at 8 hrs, at12 hrs and at 24hrs.For up to 6 hours after surgery the VAS for both the groups were similar with the values not being statistically significant. VAS was assessed againat 8 hours after surgery where Group S showed a mean VAS of 1.28±0.45and Group M showed a mean VASof1.00±0.00. This was statistically significant with a p value of0.002**.At 12 hrs after surgery, Group S showed a meanVASof1.93±0.37andGroupM recorded a meanVASof1.07±0.37.This was statistically significant with a p value of <0.001**. However, VAS assessed at 12 hours after surgery for both the groups were not statistically significant.

Analgesic requirement

In our study, the means of assessing postoperative analgesia was the time to first analgesic administration, the total amount of analgesic consumed in the first 24h our period after surgery and the VAS at different time in first 24 hour. In both the groups all 60 patients did not ask for analgesia postoperatively, since we assessed for pain only at rest and not on movement. Both the groups had excellent postoperative analgesia with mean VAS scores of<4evenat 24hours after surgery.

Gallardo J et al,[13]conducted a study which showed that VAS evaluation had a significant improvement in pain control in the group with the popliteal block after 6,12,18, and24 hours post-surgery, with pain levels peaking and being most different between 6 and 12 hours post-surgery and also exhibited a significantly lower consumption of morphine and a greater degree of patient satisfaction.

We completely agree with Gallardo J,[13] et al because in our study VAS evaluation had a significant pain control in both groups upto12 hours and patients from both the groups showed a high rate of satisfaction with the procedure and demonstrated a good discharge disposition. No significant difference in satisfaction could be detected between the 2 groups in the study. We also did not observe any anaesthesia related complications in all the 60 patients who underwent popliteal nerve block for the proposed surgical procedures.

CONCLUSION

As per our study design, we conclude that popliteal nerve block is an effective technique for anaesthesia and analgesia in patients undergoing ankle and foot surgeries. Prolonged and high quality analgesia was provided with popliteal nerve block with excellent comfort and success rate, also decreased adverse events.

We can conclude from our study that,Ropivacaine with sodium bicarbonate as additive has a faster onset of sensory and motor blockade compared to Ropivacaine with Dexamethasone as additive.

Ropivacaine with dexamethasone provides longer duration of sensory analgesia and motor blockade when compared to Ropivacaine with Sodium bicarbonate.

Both dexamethasone and sodium bicarbonate do not cause any hemodynamic instability, adverse effects or complications and provide excellent intra operative anaesthesia with post-operative analgesia.

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