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COMPARISON OF ANESTHESIA IN PATIENTS UNDERGOING UNILATERAL LOWER LIMB SURGERY, USING PERIPHERAL NERVE BLOCK VERSUS EPIDURAL ANESTHESIA ; A PROSPECTIVE RANDOMISED CLINICAL STUDY

Anaesthesiology

Dr P. S. Malviya Professor, Department of Anaesthesiology and Critical Care, Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India

Dr Rajiv Gautam* Associate Professor, Department of Anaesthesiology and Critical Care, Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India *Corresponding Author

Dr Brihaspati Tiwari Junior Resident, Department of Anaesthesiology and Critical Care, Moti Lal Nehru Medical College, Allahabad, Uttar Pradesh, India

ABSTRACT

Surgery over lower limb in patients associated with co morbidities of respiratory and / or cardiovascular system pose high risk for perioperative complications , where change in vital parameters due to anesthesia may be detrimental with patient's safety. A clinical comparison was made to find a safer technique of anesthesia in such cases undergoing surgery.

Methods: A prospective study was carried over total eighty patients associated with co morbidities which were medically treated preoperatively to optimise for anesthesia . Two groups of forty patients each were made and patients were randomly allocated to one of two groups , Epidural block (Group E) was compared with peripheral nerve blocks of lower limb given by nerve stimulator (Group P) and quality of anesthesia along with stability of vital parameters studied . Statistical analysis was done using Analysis of variance and student's t test .

Results: the demography was comparable , duration of anesthesia effect was more in patients with peripheral nerve block . group E - 152.8 ± 94 min, Group P- 295.5 ± 26 min ($P < 0.001$), changes in vital parameters were more frequent in patients given Epidural . Quality of nerve block was good using nerve stimulator , post operative analgesia was additional advantage in cases given nerve block .

Conclusion: Surgery of lower limbs under peripheral nerve block , given with the help of nerve stimulator is a safe and effective technique , it has additional advantage of post operative analgesia .

KEYWORDS

epidural anaesthesia, peripheral nerve block, lower limb surgery

INTRODUCTION:

The patients presenting for anaesthesia are frequently associated with co morbid conditions e.g. ischemic heart diseases, low ejection fraction of heart, chronic respiratory diseases or trauma cases where vitals may be compromised. The outcome of anaesthesia and surgery is risky. Starvos et al [1] in their study over patients undergoing primary joint arthroplasty observed that neuraxial anaesthesia was associated with better outcomes.

Epidural or spinal anaesthesia is also widely used in lower limb surgeries because of it's being safe and cost effective, that provides complete sensory and motor block as well as post-operative analgesia with good success rate. Changes in cardio-respiratory parameter are common, which may not be of any clinical significance in healthy patients but carry definite risk in patients with compromised respiratory and / or cardiovascular system. Peripheral nerve blocks are gaining popularity for many infraumblical surgeries with the development of new techniques such as ultrasound and nerve stimulator[2] Selective blocks of lower limbs provide surgical anaesthesia of lower limbs. It avoids the sympathectomy associated with neuraxial blocks and may therefore, be advantageous when any shift in hemodynamics could be deleterious during operation. Hence it appears better option for operations for high risk cases where general aesthesia or central neuraxial blocks may be risky. Peripheral nerve blocks have proved safe in patients with polytrauma posted for emergency surgery and also for patients associated with co morbidities.

The study is, therefore, proposed to evaluate the quality as well as safety of anaesthesia using combined nerve blocks of lower extremity (Sciatic nerve, Femoral nerve, lateral femoral cutaneous nerve or obturator nerve) in lower limb surgery in high risk patients and compare it with epidural anaesthesia.

MATERIAL AND METHODS

The proposed study was carried out at S.R.N. Hospital associated with M.L.N. medical college, Allahabad (Prayagraj) during period of one year. After approval from ethical committee and obtaining written and informed consent from the patient the cases were included for study.

This study involved 80 patients of the age group ranging 18-60 year of either sex undergoing unilateral lower limb surgery associated with co morbidity, belonging to ASA (American Society of Anaesthesiologists) physical status II or III. The co morbid condition was treated well before start of anesthesia.. Following cases were excluded from the study.

1. lack of consent
2. Patients having hepatic or renal disease
3. Critically ill trauma patients
4. Patients with age <18 and >60 years
5. Local infection
6. Coagulopathy
7. Previous vascular grafting
8. Local adenopathy
9. Patients having neurological or psychiatric illness
10. Patients allergic to local anesthetic drug
11. Pregnant patients

After randomization and Blinding, patients were allocated one of the following two groups -

GroupE : Patients received epidural anaesthesia using mixture of equal volumes of lignocaine 2% with Adrenaline plus ropivacaine 0.75% (total 12-15ml volume depending on individual case)

Group P : peripheral nerve block using nerve stimulator was given under sedation. All cases were given IV Midazolam 0. 5 – 1 mg with local anaesthetic drugs in same ratio as mentioned above (Philippe C et al) [3]. Following nerves were blocked routinely.

1. Sciatic nerve block - with posterior (classic) approach.[4]
2. Femoral nerve (3 in 1) block.
3. Lateral cutaneous nerve of thigh or obturator nerve block were given as and when required.

Following observations were made perioperatively

1. The time of onset and duration of anaesthesia after epidural or peripheral nerve block.
2. Haemodynamic parameters - heart rate, blood pressure, oxygen saturation.
3. The level of sensory block (assessed by pin prick) and motor block (assessed by modified Bromage scale)
4. Assesment of Pain with Visual analogue scale (it range from 0 indicating no pain and 10 indicating worst imaginable pain).

Statistical Analysis: Statistical analysis was performed using Microsoft Excel 2010 and online statistical calculation website.

Student t test (paired and unpaired), and ANOVA test. Data were presented as mean ± S.D. A 'p' value of <0.05 was considered significant and p<0.001 was considered statistically highly significant.

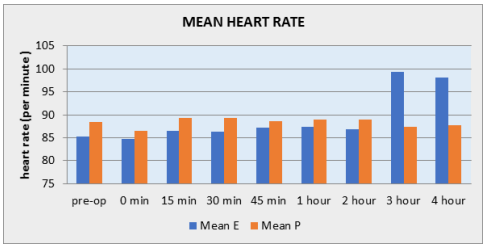
RESULTS: :

1. Statistically there was no significant difference in height and weight of patient between two groups (P>0.05)
2. **Mean heart rate (per minute)**

***Table-1* showing mean heart rate**

Heart rate	Group E	Group P	P value
Pre-op	83.32± 5.61	88.52±6.39	0.019
0 min	84.6±5.44	86.5± 5.85	0.088
15 min	86.5±5.43	89.27±7.93	0.072
30 min	86.25±5.28	89.35±8.41	0.052
45 min	87.15±4.79	88.67±7.15	0.267
1hour	87.3±5.01	89.05±6.65	0.188
2 hour	86.7±5.34	89.00±6.42	0.085
3 hour	99.42±4.84	87.3±8.07	<0.001
4 hour	98.15±3.79	87.72±7.51	<0.001

Graph-1 : Showing Mean heart rate distribution

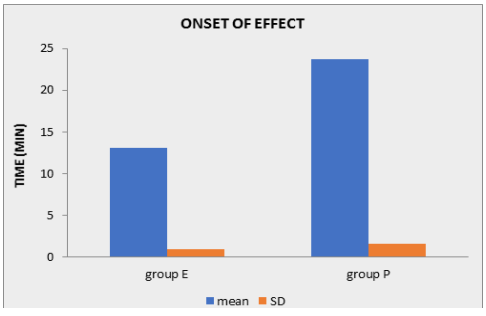


Statistically, there was no significant difference in mean heart rate up to 2hour(P>0.05). But after 2 hour mean heart rate increase in group E in comparison to group P and this difference which was statistically highly significant (<0.001). The effect of epidural anaesthesia went away at near 3rd hour leading to rise in the heart rate.

***Table– 2*, showing onset of anaesthesia effect, (duration in minutes).**

N=4	Group E	Group p	P value
Mean +-SD	13.12±0.965	23.7±1.53	<0.001
Range(min)	11- 16	20 - 27	

Graph - 2 showing time duration of onset of anaesthesia effect in two groups.



Onset of effect was longer in group P in comparison to group E and this difference was highly significant (p<0.001).

Table – 3. Total Duration of anaesthesia effect. (in minutes)

N=40	Group E	Group P	P value
Mean +-SD	152.8±4.94	295.5±26.50	<0.001
Range (min)	140-210	240-340	

Total duration of effect was longer in group P in comparison to group E and this difference was **highly significant** (p<0.001).

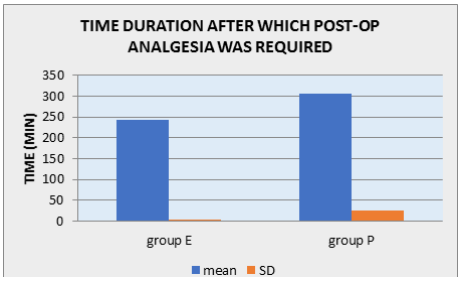
Table – 4 Showing different co morbid conditions.

Co morbid Illness	Group E	Group P	Total
Chronic obstructive pulmonary diseases	14	13	27
Low ejection fraction (more than 40 %) Cardiac patients	14	14	28
Incisin and drainage	4	4	8
Debridgement of diabetic foot	8	9	17

Table – 5: Showing time duration (minutes) after which post operative analgesia was required.

N = 40	Group E	Group P	P value
Mean+S D	242.37	305.37 + 26.39	< .01
Range (Min)	220 - 260	250 - 230	

Graph-3 Time duration after which post op analgesia was required



Statistically there was highly significant difference in time duration after postop analgesia was required(P<.001)

ADVERSE EFFECT AND COMPLICATIONS

No patient in any group had significant hypoxemia there was occurrence **of intra-operative** hypotension in groups E.

INTRA-OPERATIVE HYPOTENTION

Groups	Hypotension	percentage
E (n = 40)	5	12.5
P (n = 40)	0	0

There was no occurrence of intra-operative and post-operative nausea, vomiting, respiratory depression, shivering, bradycardia in both groups, but post-operative hypotension and tachycardia was present in group E (number of positive cases in % sample size 40).

Groups	E	P
Hypotension	12.00	0.00
Hypoxia	0.00	0.00
Bradycardia	0.00	0.00
Nausea/ vomiting	0.00	0.00
Shivering	0.00	0.00
Pruritus	0.00	0.00
Tachycardia	12.00	0.00

DISCUSSION:

Peripheral nerve blocks given with peripheral nerve stimulator have been successfully used in patients with trauma patients posted for emergency surgery and also for patients associated with co morbidities, who are at risk of complications due to alteration of hemodynamic parameters caused by anaesthetic technique. Neuraxial anesthesia in the form of epidural or subarachnoid block has always been considered as the gold standard technique for lower extremity sugeries

Philippe C et al. [5] used mixtures of equal volume of lignocaine 2 % (with adrenaline) 400 mg and ropivacaine 0. 75 % 150 mg in their study to produce femoral – sciatic nerve blocks and observed complete block of sufficient duration for such lower limb surgeries within 30 min in all cases. They observed no significant fall in BP and heart rate in patients. Their findings correspond with our observations. Bergmann I et al [6] carried out study over patients suffering from Diabtes Mellitus, Renal failure or low ventricular ejection fraction and compared cardiovascular stability of nerve blocks and general anesthesia in patients posted for outpatient knee arthroplasty and concluded that blocks showed stable vital parameters during operation. Our observations also correspond that of singh A and Trivedi [7] while giving peripheral nerve block using a mixture of Bupivacaine and lignocaine observed observed stable cardio respiratory parameters.

SpO2 values (oxygen saturation) between two groups was was well maintained throughout peri operative period and the difference was statistically insignificant (P >0.05), similar findings have been observed by many other workers. There was no occurrence of intra-operative nausea, vomiting, respiratory depression, shivering or, bradycardia in the two groups.

Onset of block:
In the present study, it was observed that the block in both groups showed early onset of anesthetic effect as compared to if Ropivacaine were used alone. similar observation have been published in research work of Piacherski and Macrochkov [8]. their work on sciatic nerve block with a mixture of Ropivacaine and Lignocaine showed short onset of block with no decrease in time of post operative analgesia. However, they recommended additional research to explain the mechanism On comparing the result of our study with the results of above mentioned studies we found that onset of block was prolonged in group P in comparison to group E($p<0.001$). The difference is well expected since it takes longer for anesthetic solution to penetrate and produce it's effect in a thick nerve.

Duration of block :
In our study, we found that the duration of block in group E (in which epidural anesthesia was given) was 140-160 min (152 ±4.94min), the finding was intermediate between duration effect if either of two drugs were given alone. Seow L T et al [9] noted same phenomenon when he combined Bupivacaine and Lignocaine.

In the present study, it was observed, that the duration of block in group P, in which "combined sciatic- femoral block" was given,was 295+/-26.50 min which is in accordance to V. Chakravarthy et al(2004) [10]who reported duration of sensory block was 203.1+/-29.8 min and that of motor block was 180+/-22.5.

Post –operative analgesia requirement:
In the present study, it was observed that time of 1st analgesic requested by patient, in group P (combined sciatic- femoral block) was275±26.59 min which is significantly ($p<0.001$) more in comparison to group E 242.92±3.73 which was in accordance to the study of Fanelli, Guido MD. et al (1998) [11]who observed that duration of post-operative analgesia was significantly longer with use of ropivacaine with a sufficient decrease of analgesia requirement in post-operative period.Casati A, Grispignic C et a [12] comparedsciatic-femoral block with epidural anaesthesia. There was significantly prolonged analgesia observed in sciatic–femoral block. We also found that longer postoperative analgesia was observed in sciatic- femoral group.

Quality of analgesia during intra-operative period:
Quality of analgesia was assessed by VAS score during intra-operative period. In our study VAS score in group E was 1.00±0.905 and in group P 1.37±1.74 which was statistically not significant($p >0.05$).

None of the groups required an additional analgesic agent except in group P, where 5 patients requested for supplemental analgesia in intra-operative period.

Quality of motor blockade:
It was assessed by Bromage Scale, which was found satisfactory in both groups. The Bromage scale showed in group E 3.5±0.640 and in group P 3.25±0.776 which was statistically not significant (>0.05). Hence there was no difference.

CONCLUSION
We conclude that the "combined sciatic-femoral nerve block" for use in lower limb surgeries is effective, complication free and safe technique of anaesthesia with the use of peripheral nerve stimulator in terms of technical ease. It can replace central Neuraxial block in cases of lower limb surgeries where co morbid conditions may lead to further complications.

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