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PERINEURAL DEXAMETHASONE WITH ROPIVACAINE VERSUS DEXAMETHASONE ALONE IN PROVIDING POSTOPERATIVE ANALGESIA

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ABSTRACT

Background: Painful thoracotomy procedures can result in consequences such as pneumonia, at electasis, and respiratory failure if pain is not well managed. Furthermore, 30 to 50 percent of patients experience chronic post-thoracotomy pain (CPTP), which can last for months and significantly reduce their quality of life. Adjuvants are typically utilised to create long-term analgesia in peripheral nerve blocks, as a single dosage of local anaesthetics only produces limited duration analgesia.

Aim: The purpose of this research was to compare the effectiveness of perineural dexamethasone with ropivacaine against dexamethasone alone in delivering postoperative analgesia for TPVB (thoracic paravertebral block) during elective thoracotomies.

Methods: A total of 105 thoracotomy patients were divided into three groups of 35 patients each at random each was Group I was treated with saline, Group II with ropivacaine 0.5%, and Group III combination of 5mg dexamethasone and 0.5 percent ropivacaine). Recuperation time, surgical analgesia, and chronic pain were the criteria evaluated in the three groups.

Results: The findings showed that the length of time spent in the PACU was 126.68±74.94, 86.56±30.32, and 82.41±30.05 minutes for Groups I, II, and III, respectively. These differences were statistically significant for Groups I and II, as well as Group II and III, with p-values of 0.006 and 0.005, respectively, but not for Group I and III (0.783). Group I, II, and III woke up at 68.50±71.33, 45.40±28.78, and 35.22±19.28 minutes, respectively. The difference between Group II and III was statistically significant (p=0.02), but the differences between Group I and II and I and III (p-values of 0.093 and 0.465) were not significant. With p1, p2, and p3 values of 0.746, the mean postoperative hospital stay for Group I, II, and III individuals was 16.63±12.44, 10.86±3.17, and 11.64±3.42, respectively. These results were statistically non-significant. VAS showed statistical non-significant results at 12, 48, and 72 hours, with p-values of 0.912, 0.683, and 0.533, respectively. However, on the intergroup comparison at day 24, VAS showed statistical significance with a p-value of less than 0.0001.

The current study shows that there are additional benefits to utilizing an opioid-based anaesthetic protocol in thoracic paravertebral block, such as a lower incidence of chronic pain, a shorter recovery period, and higher analgesia quality following thoracotomy. This protocol combines perineural dexamethasone with ropivacaine.
Keywords: Chronic pain, dexamethasone, perineural dexamethasone, nerve block, ropivacaine thoracotomy

INTRODUCTION

Painful thoracotomy procedures can result in consequences such as pneumonia, atelectasis, and respiratory failure if pain is not well managed. Furthermore, 30 to 50 percent of patients experience chronic post-thoracotomy pain (CPTP), which can last for months and significantly reduce their quality of life.[1] After thoracotomy, there is reduced pain after implementing multimodal and preventative strategies for postoperative pain management.

Therefore, effective pain treatment during the perioperative period can lower the likelihood and frequency of postoperative discomfort. Thoracic epidural analgesia, or TEA, is the most widely used analgesic technique for thoracotomy. But it comes with drawbacks, such as coagulopathy.[2]

Thoracic paravertebral block (TPVB) is utilised as an alternative to TEA in order to get over these drawbacks and restrictions. In patients having thoracotomy, TPVB causes minimal adverse effects and offers sufficient analgesia. Additionally, improved respiratory parameters, fewer hemodynamic issues, and less neurologic issues are benefits of TPVB. Furthermore, data from earlier studies shows that TPVB lessens chronic pain after breast surgery that is neuropathically mediated, or chronic post-thoracotomy pain.[3]

It is unclear what mechanism TPVB uses to lessen persistent post-thoracotomy discomfort. Adjuvants are typically utilised to create long-term analgesia in peripheral nerve blocks, as a single dosage of local anaesthetics only produces limited duration analgesia.

When administered in conjunction with ropivacaine as a local anaesthetic in TPVB, dexamethasone successfully lowers acute pain, has fewer adverse effects during the early post-surgery period, and also lowers the incidence of chronic post-thoracotomy pain.[4]

Therefore, the purpose of the current study was to evaluate the effectiveness of dexamethasone alone versus perineural dexamethasone plus ropivacaine in providing postoperative analgesia in TPVB (Thoracic paravertebral block) during elective thoracotomy. This was accomplished through the conduct of a prospective, randomised clinical study. The individuals receiving thoracotomy at the Institute made up the study population. The research had 105 participants of both sexes, with an average age of 41.46±4.24 years, and a range of ages between 18 and 75.

Subjects receiving thoracotomy, being between the ages of 18 and 75, having an ASA status of I or II, and being willing to participate in the study were the inclusion criteria for the research. Subjects with peptic ulcers, prior thoracotomies, severe chronic obstructive pulmonary disease, peripheral and central neuropathies, heart disease, coagulopathy, pre-operative chronic opioid treatment, and allergies to local anaesthetics were excluded from the study.

Three groups of 35 people each were randomly allocated to the 105 research participants who were enrolled. Group III received a combination of 5 mg dexamethasone and 0.5 percent ropivacaine, whereas Group I received saline therapy. Group II received ropivacaine 0.5%.

Three groups of people had their levels of chronic pain, recovery duration, and postoperative analgesia evaluated after describing the intricate study plan. Every participant provided written and verbal informed permission. In order to induce anesthesia, a traditional TPVB block was administered with the traditional method, which involved employing an ultrasound-guided parasagittal out-of-plane approach. Anaesthesia was administered using a sterile and aseptic technique following skin preparation. Saline or local anaesthetic was administered to the vertebrae T5-T6, T4-T5, and T3-T4 in cases of paravertebral gaps.

Pleura was shown to be moving southward based on ultrasonography. Prior to surgery, all individuals were kept off food for at least six hours. The following parameters were measured at baseline upon admission to the operating room: pulse rate, diastolic and systolic blood pressure, and mean arterial blood pressure. Spo2 was also given some thought. Every subject had an intravenous access established using an aseptic cannula. A subarachnoid block was administered while the patient was supine, and the parameters were evaluated.

After anesthesia, measurements were taken of the mean arterial blood pressure, diastolic and systolic blood pressure, and pulse rate at 5, 10, 30, 60, 90, and 120 minutes. When the change in mean arterial pressure from baseline values was less than 20%, a 6 mg injection of mephenteramine was administered.

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The length of post-operative activity, hospital stay, cost, and CPTP were evaluated as postoperative complications. Using SPSS software version 21 (Chicago, IL, USA) for statistical assessment and one-way ANOVA and t-test for result formulation, the gathered data were examined. The data were presented as a mean, standard deviation, percentage, and number. At $p<0.05$, the significance threshold was maintained.

RESULTS

In order to determine whether combination of dexamethasone and ropivacaine is more effective in providing postoperative analgesia in TPVB (thoracic paravertebral block) after elective thoracotomy, a prospective, randomised clinical research was carried out. The study comprised 105 individuals of both genders, ranging in age from 18 to 75 years, with an average age of 41.46±4.24 years. The demographic information for the research participants is included in Table 1.

Group I, II, and III had mean ages of 66.02±6.47, 61.98±7.92, and 61.45±7.24 years, respectively. A statistically non-significant p value of 0.064 indicated that these values were not significant. In the current study, there were 88.57% (n=31), 65.71% (n=23), and 85.71% (n=30) male participants. 34.28% (n=12) of the participants in Group I and 37.14% (n=13) of the subjects in Groups II and III had the ASAI status. For 8.57% (n=3), 28.57% (n=10), and 88.57% (n=31) of the participants in Groups I, II, and III, respectively, the lung was the surgical site for the thoracotomy whereas, the site was esophagus in 91.52% (n=32), 71.42% (n=25), and 11.42% (n=4) study subjects respectively from Group I, II, and III (Table 1). With corresponding p-values of 0.942, 0.754, 0.124, and 0.694 for weight, mean BMI, mean arterial pressure, and heart rate, respectively, all measures exhibited statistically non-significant changes at baseline.

The duration of the PACU stay for Group I, II, and III was found to be 126.68±74.94, 86.56±30.32, and 82.41±30.05 minutes, respectively, after the intraoperative parameters of the study subjects were evaluated. These results were statistically significant for Group I and II, and Group II and III, with respective p-values of 0.006 and 0.005, but not significant between Group I and III (0.783). The I, II, and III groups woke up at 68.50±71.33, 45.40±28.78, and 35.22±19.28 minutes, respectively. A statistically significant difference (p=0.02) was seen between Group II and III. and non-significant between Group I and II and I and III with p-values of 0.093 and 0.465. Additionally, there was a statistically significant difference in sufentanil consumption between Group I and Group II (p=0.01), compared to 0.197 and 0.266 for Group II and III and Group I and Group III, respectively. In three groups, there were statistically non-significant differences in extubation time, phenylephrine intake, crystalloid and colloid consumption, lung ventilation duration, and operation length (Table 2).

Regarding the research participants' postoperative parameters, the mean postoperative hospital stay was found to be 16.63±12.44, 10.86±3.17, and 11.64±3.42 in Group I, II, and III, respectively. These values were statistically non-significant, with p1, p2, and p3 values of 0.746. With p1, p2, and p3 of 0.763, the first out-of-bed activity for research individuals in Groups I, II, and III was at 4.55±2.29, 3.31±1.26, and 3.17±1.05 days. These results were not statistically significant.

For research participants I, II, and III, the mean total of pressing numbers was 32.93±22.13, 23.86±17.07, and 19.36±15.04; the results were non-significant, with p=0.415. With p-values of 0.912, 0.683, and 0.533 at 12, 48, and 72 hours, respectively, VAS was statistically non-significant; however, on the intergroup comparison at day 24, VAS was statistically significant at <0.0001 (Table 3).

The incidence of PONV and persistent postoperative pain were also evaluated in the current investigation. The study's findings demonstrated that all individuals in all three groups had PONV scores of 0. Fourteen percent (n=17) of Group I patients, twenty percent (n=7) of Group II subjects, and twenty percent (n=10) of Group III individuals reported having chronic postoperative discomfort.

Table 4 shows that this difference was non-significant between Group II and III (p=-.165) and between Group I and II (p=0.05), but statistically significant between Group I and II (p=0.01).

DISCUSSION

The study's findings demonstrated that the intraoperative parameters in the research subjects revealed that the

length of time spent in the PACU was 126.68±74.94, 86.56±30.32, and 82.41±30.05 minutes for Groups I, II, and III, respectively. These differences were statistically significant for Groups I and II, as well as Group II and III, with corresponding p-values of 0.006 and 0.005, but not between Groups I and III (0.783). The I, II, and III groups woke up at 68.50±71.33, 45.40±28.78, and 35.22±19.28 minutes, respectively, where there was a statistically significant difference between Group II and III with p=0.02, and non-significant between Group I and II and I and III with p-values of 0.093 and 0.465.

Additionally, there was a statistically significant difference in sufentanil consumption between Group I and Group II (p=0.01), compared to 0.197 and 0.266 for Group II and III and Group I and Group III, respectively. In the three groups, there were statistically non-significant differences in extubation time, phenylephrine intake, crystalloid and colloid consumption, lung ventilation duration, and operation length. These findings were in line with research conducted in 2006 by Kairaluoma PM et al. and in 2014 by Lin X et al., who revealed intraoperative parameters that were similar to those of the current study.

The mean postoperative hospital stay for Group I, II, and III study participants was 16.63±12.44, 10.86±3.17 and 11.64±3.42, respectively, for the postoperative parameters. These values were statistically non-significant, with p1, p2, and p3 values of 0.746.

With p1, p2, and p3 of 0.763, the first out-of-bed activity for research individuals in Groups I, II, and III was at 4.55±2.29, 3.31±1.26, and 3.17±1.05 days. These results were not statistically significant. For research participants I, II, and III, the mean total of pressing numbers was 32.93±22.13, 23.86±17.07, and 19.36±15.04; the results were non-significant, with p=0.415. With p-values of 0.912, 0.683, and 0.533 at 12, 48, and 72 hours, respectively, VAS was statistically non-significant; however, on the intergroup comparison at day 24, VAS was statistically significant at <0.0001. These findings were consistent with research conducted by Geng W et al. (2015) and Mihara R et al. (2011), who found comparable postoperative parameters based on their own investigations.

The incidence of PONV and persistent postoperative pain were also evaluated in the current investigation. The study's findings demonstrated that all individuals in all three groups had PONV scores of 0. Fourteen percent (n=17) of Group I patients, twenty percent (n=7) of Group II subjects, and twenty percent (n=10) of Group III individuals reported having chronic postoperative discomfort. The difference was non-significant between Group II and III (p=-0.165) and between Group I and III (p=0.05), but statistically significant between Group II and Group I (p=0.01). The findings of this study were similar to those of Wang K et al[9] in 2017 and Sengupta S[10] in 2016, whose authors found similar rates of postoperative chronic pain and PONV.

CONCLUSION

The current study concludes, within its limitations, that the use of an opioid-based anaesthetic protocol in thoracic paravertebral block, using perineural dexamethasone with ropivacaine, has additional benefits, such as a lower incidence of chronic pain, a shorter recovery period, and better analgesia quality following thoracotomy. Better healing, fewer problems, lower dosages, efficient pain management, and a decrease in chronic pain following surgery are further outcomes of this. A few drawbacks of the current study were, nonetheless, a limited sample size, a brief monitoring period, and biases related to geographic areas. Therefore, further long-term research with bigger sample sizes and longer observation periods will aid in coming to a conclusive result.

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TABLES

Characteristics	Group I (n=35)	Group II (n=35)	Group III (n=35)	p-value
Age (years)	66.02±6.47	61.98±7.92	61.45±7.24	0.064
Gender % (n)				
Males	88.57 (31)	65.71 (23)	85.71 (30)	
Females	11.42 (4)	34.28 (12)	14.28 (5)	
Weight (kg)	59.93±11.86	59.56±9.68	60.78±8.57	0.942
ASA status				
I	34.28 (12)	37.14 (13)	37.14 (13)	
II	65.71 (23)	62.85 (22)	62.85 (22)	
BMI (kg/m^2)	21.21±3.27	21.81±3.33	21.79±2.26	0.754
Mean arterial pressure	94.02±14.85	95.98±9.94	102.26±15.64	0.124
Heart rate	74.46±10.81	72.31±9.27	75.31±15.82	0.694
Surgical site				
Lung	8.57 (3)	28.57 (10)	88.57 (31)	
Esophagus	91.42 (32)	71.42 (25)	11.42 (4)	

Table 1: Demographic characteristics of the study subjects

Variables	Gr I (n=35)	Gr II (n=35)	Gr III (n=35)	p^1 I-II	p^2 II-III	p^3 I-III
PACU duration (mins)	126.68±74.94	86.56±30.32	82.41±30.05	0.006*	0.005*	0.783
Extubation time (mins)	51.64±43.14	35.81±18.53	36.02±19.86	0.069	0.06	0.987
Awakening time (mins)	68.50±71.33	45.40±28.78	35.22±19.28	0.093	0.02*	0.465
Phenylephrine consumption (µg)	68.68±101.43	46.94±87.15	22.84±27.07	0.353	0.04	0.319
Sufentanil consumption (µg)	57.15±12.44	49.56±10.44	53.08±7.69	0.01*	0.197	0.266
Crystalloid consumption (ml)	1391.28±393.04	1314.56±467.55	1576.17±607.4	0.594	0.217	0.082
Colloid consumption (ml)	421.72±328.87	520.81±312.07	576.17±277.34	0.272	0.103	0.547
Lung ventilation duration (mins)	96.50±66.07	108.02±73.92	95.93±65.26	0.564	0.976	0.556
Surgery duration (mins)	160.94±62.54	169.77±78.88	156.69±69.95	0.667	0.841	0.536

Table 2: Intraoperative variables in the three groups of study subjects

Parameters [days]	Group I (n=35)	Group II (n=35)	Group III (n=35)	p-value^1 I-II	p-value^2 II-III	p-value^3 I-III
Postoperative hospital stay	16.63±12.44	10.86±3.17	11.64±3.42	0.746	0.746	0.746
First out of bed activity	4.55±2.29	3.31±1.26	3.17±1.05	0.763	0.763	0.763
Pressing numbers sum	32.93±22.13	23.86±17.07	19.36±15.04	0.415	0.415	0.415
VAS (hours)						
6	0.94±1.17	0.56±0.81	0.22±0.42	0.194	0.191	0.196
12	1.07±0.88	0.48±0.64	0.46±0.58	0.912	0.912	0.912

24	1.72±1.04	1.73±1.06	0.83±0.42	<0.0001	<0.0001	<0.0001
48	2.02±1.07	1.44±1.16	1.31±0.64	0.683	0.683	0.683
72	2.02±1.43	1.27±0.93	1.12±0.65	0.533	0.533	0.533

Table 2: Intraoperative parameters in the three groups of study subjects

PONV	Group I (n=35)	Group II (n=35)	Group III (n=35)	p^1 I-II	p^2 II-III	p^3 I-III
0	100 (35)	100 (35)	100 (35)	0.323		
1	0	0	0			
2	0	0	0			
3	0	0	5			
Chronic pain	48.57 (17)	28.57 (10)	20 (7)	0.01*	0.165	0.05

Table 4: Incidence of PONV and chronic postoperative pain 72 hours after surgery