

Epidural dexamethasone and ropivacaine for postoperative analgesia in patients of carcinoma rectum undergoing lower anterior resection (LAR)

Sheikh Irshad Ahmad,¹ Gowhar Hameed,² Gani Tanveera,³ Tantry Gani Tariq,⁴ Mohammad Bhat Wasim,⁵ Hussain Mir Aabid⁶

^{1,2,4,6} Department of Anesthesiology & Critical Care, SKIMS

³ Director Health Services, J&K

⁵ Department of Anesthesiology, SKIMS Medical College Bemina.

ABSTRACT

Objective(s): This prospective, randomized, double blind study was undertaken to establish the effect of addition of Dexamethasone as an adjunct to epidural Ropivacaine in patients of carcinoma rectum undergoing lower anterior resection.

Material and Methods: Ninety patients of ASA (American Society of Anesthesiologists) class I and II undergoing lower anterior resection were enrolled to receive either 6mg or 8mg or 10mg of dexamethasone along with epidural Ropivacaine to a total of 10ml test solution in each group for epidural analgesia. Hemodynamic parameters, postoperative analgesia, total requirement of rescue analgesia and adverse events were monitored.

Results: Analgesia in the postoperative period was better in Group receiving 10mg of dexamethasone associated with less postoperative rescue analgesic consumption

Conclusion: Hence, addition of dexamethasone 10mg to epidural Ropivacaine can be advantageous with respect to better postoperative analgesia.

Keywords: Dexamethasone, Epidural, Ropivacaine

JMS: 2019; 22(1):29-36 DOI: <https://doi.org/10.33883/jms.v22i1.379>

INTRODUCTION

Pain after surgery is inevitable and can adversely affect both physical and physiological functions. Despite improved analgesic and sophisticated drug delivery systems, surveys indicate that up to 86% of patients experience moderate to severe pain after surgery.¹

Corticosteroids have a powerful anti-inflammatory action and have demonstrated to reduce pain and swelling after various surgeries, but the exact mechanism of the analgesic effect is not fully understood.² Recently dexamethasone has been added to the list of adjuvants to caudal and lumbar epidurals.

In our study we used dexamethasone in three different doses

as an adjunct to epidural Ropivacaine for postoperative analgesia in patients of carcinoma rectum undergoing low anterior resection.

MATERIAL AND METHODS

“Epidural dexamethasone and ropivacaine for postoperative analgesia in patients of carcinoma rectum undergoing low anterior resection (LAR)”: a prospective randomized double-blind study, was conducted in the

Correspondence:

Dr. Sheikh Irshad Ahmad M.D.

Additional Professor, Department of Anesthesiology & Critical Care SKIMS

Email: shkirshada@gmail.com

Access this article online



Website:
www.jmsskims.org

DOI:
<https://doi.org/10.33883/jms.v22i1.379>

How to cite this article: Sheikh IA, Gowhar H, Tanveera G, Tariq TG, Wasim MB, Aabid HM. Epidural dexamethasone for postoperative analgesia in patients of carcinoma rectum undergoing lower anterior resection (LAR). jms [Internet]. 2019Mar.29 [cited 2019Apr.8];22(1). Available from: <http://www.jmsskims.org/index.php/jms/article/view/379>

Received: 02-02-2019 Accepted: 25-03-2019

department of anesthesiology and critical care, in a tertiary care hospital on 90 patients belonging to American Society Of Anesthesiologists (ASA) class I and II, of either sex, aged between 20-70 years, posted for elective surgery from may 2015 to May 2017 after approval by the Institutional Ethical Committee and an informed written consent was obtained from all the patients for participation in this study. Pre-anaesthetic evaluation was done for all participants. Patients who refused for study, had infection at local site, deformity of lumbar spine, raised intracranial tension, patients with neurological deficits or psychiatric disorders, bleeding disorders, patients on anti-platelet and anti-coagulant drugs, hypersensitivity to drugs in study, patients on pain modifying drugs, patients with chronic painsyndromes, uncontrolled hypertension and diabetes, morbidly obese patients and active peptic ulcer disease were excluded from the study.

The study population was divided randomly into three groups of 30 patients each using sealed envelope technique. Group X consisting of 30 patients received 0.2% Ropivacaine (7.5ml) and 6 mg dexamethasone (1.5ml) diluted with 1 ml of normal saline to total of 2.5 ml test solution, Group Y consisting of 30 patients received 0.2% Ropivacaine (7.5ml) and 8mg Dexamethasone(2.0ml) with 0.5 ml of normal saline to a total of 2.5 ml test solution. Group Z consisting of 30 patients received 0.2% Ropivacaine (7.5ml) and 10 mg Dexamethasone(2.5ml, undiluted). Total volume administered through epidural catheter was 10 ml in each group. Test solution contained 7.5ml of 0.2% Ropivacaine with 2.5 ml of Dexamethasone diluted or undiluted. Prior to the surgery, all the patients underwent routine pre-anesthetic evaluation as per standard protocol of the department. Tablet ranitidine 150 mg and Alprazolam 0.25-0.5 mg orally night before surgery was given to all the patients. Any concomitant medications were continued as indicated by the standard protocol of the department. Patients were advised to remain fasting for at least 6- 8 hours prior to surgery. The patients were laid supine on the operating table and multichannel monitor was attached for monitoring of ECG, HR, NIBP and SpO2 and recorded. Then patients were again briefed about technique of epidural anesthesia in their language and explained the standard visual analogue pain scale for pain evaluation in postoperative period. Intravenous line was established with 18/20G intravenous cannula for intra operative

administration of fluids and drugs. The patients were positioned in lateral decubitus position/sitting position whatever was comfortable to patient for giving epidural blockade.

Drugs were prepared by anesthesiologist not involved in study and equipments necessary for resuscitation and general anesthesia administration were kept ready. Under all aseptic precautions the block was performed in sitting/lateral decubitus position in the midline approach at L3 - L4 space. The interspace was infiltrated with 1 ml of lignocaine, raising a small wheal. After 1-2 minutes of local infiltration, 18 gauge Tuohy's needle was introduced and epidural space confirmed by loss of resistance technique. After negative aspiration of blood and Cerebrospinal fluid (CSF), 20gauge epidural catheter was threaded in through the Tuohy needle up to 3-5cm in the epidural space in the cephalad direction. The Tuohy needle was slowly withdrawn and epidural catheter fixed firmly to the back of the patient. Placement of the epidural catheter was confirmed by aspiration for absence of Cerebrospinal fluid (CSF) and blood. Epidural label was attached to the catheter for the purpose of identification. After giving epidural the patient was placed in the supine position on the operating table. In order to exclude both subarachnoid and intravascular injection, a test dose of 3ml of 1.5% lidocaine and 1:200000 epinephrine was given through the catheter. Patients getting motor blockade or tachycardia within 5 minutes indicates subarachnoid and intravascular placement of catheter and these patients were to be excluded from the study. After confirming correct placement of the epidural catheter the study drugs were administered. Pulse, blood pressure, ECG, and SpO2 were recorded before and after giving the regional block. The study drugs were injected epidurally 20 minutes before induction of anaesthesia to achieve adequate distribution within the epidural space. Hypotension defined as 20% decrease of mean arterial blood pressure compared with preoperative control levels was treated with rapid infusion of intravenous fluids and intravenous ephedrine administered in small increments of 6mg. Intravenous atropine 0.02mg/kg was administered for bradycardia (heart rate less than 50 beats/min). Oxygen supplementation was provided in case of respiratory depression (SpO2< 90% and respiratory rate <8). Patients were induced with Propofol, Fentanyl and atracurium according to the standard dosing per kg body

weight of the patient. Anesthesia was maintained with nitrous oxide in oxygen and isoflurane. Ventilation was controlled with a tidal volume of 10ml/kg and respiratory rate adjusted to maintain ETCO₂ between 30-35mmHg. Increase in the HR or Mean arterial BP by more than 20% of baseline intra operatively while keeping all the parameters constant was considered as the patient having pain and was treated by giving intra venous fentanyl boluses of 50mcg. Patients were reversed with Neostigmine and Glycopyrrolate as per the standard dosing per kg weight and extubated. In the postoperative period the following parameters were evaluated:

Pain assessment: The pain was evaluated on standard 10 point visual analogue scale (VAS score 0=no pain, 1-3 = mild pain, 4-6 = moderate pain and 7-10 = severe pain) for 24 hours post-operatively (two hourly for first 8 hours then four hourly for next 16 hours). If VAS was ≥ 3 , a bolus of tramadol 1.5 mg/kg in 0.9% normal saline to make a total volume of 10 ml was administered epidurally. Following parameters were noted in the postoperative period:

Time to get the first top-up of rescue analgesia (tramadol) in post operative period, total number of top-ups (frequency) and any untoward adverse effect like nausea/ vomiting, pruritis and wound infection. After 24 hours epidural catheter was removed by confirming the blue tip in all

patients under aseptic precautions and anti septic dressing applied.

RESULTS

The three groups were comparable with respect to age, sex, weight and ASA status (Table 1).

Table 1: Demography			
Parameters	Group X	Group Y	Group Z
Age (years)	54.3 $\pm$ 11.47	50.7 $\pm$ 13.26	53.6 $\pm$ 9.47
Weight (kg)	62.4 $\pm$ 7.27	63.57 $\pm$ 7.3	62.7 $\pm$ 7.34
ASA (I/II)	17/13	16/14	18/12
Gender M/F	11/19	17/13	14/16
p>0.05			

Pre-operative heart rate (Beats/min) was statistically non significant between the three groups (p =0.6304). Intraoperative heart rate and Postoperative heart rate (Beats/min) was statistically significant between the three groups (p=0.003) (Table 2).

Baseline mean arterial pressure (mmHg) was statistically non significant between three groups (p =0.926). The overall mean arterial pressure during intraoperative and postoperative period was significant between three groups (p<0.001*). (Table 3)

Table 2: Showing heart rate (beats/min) among various groups at different intervals of time

Time Interval	Group X		Group Y		Group Z		P-value			
	Mean	SD	Mean	SD	Mean	SD	Overall	X vs Y	X vs Z	Y vs Z
BL	78.35	14.46	79.80	9.54	80.60	15.17	0.864	0.731	0.595	0.850
5 Min	84.05	16.58	79.25	9.07	81.70	11.71	0.501	0.242	0.565	0.549
10 Min	84.25	9.45	84.90	8.04	80.45	8.68	0.229	0.175	0.815	0.113
15 Min	86.10	8.16	83.35	8.80	83.90	9.65	0.621	0.332	0.671	0.584
20 Min	86.20	11.10	83.05	6.20	80.70	10.67	0.199	0.303	0.075	0.441
25 Min	85.10	11.54	84.10	5.12	80.40	14.40	0.404	0.570	0.060	0.158
30 Min	84.85	15.27	83.55	4.49	81.75	12.01	0.566	0.461	0.156	0.513
45 Min	93.30	17.05	84.60	6.61	82.80	11.69	0.002*	0.032*	<0.001*	0.392
1 Hr	94.60	18.30	81.40	8.52	79.90	5.24	<0.001*	<0.001*	<0.001*	0.362
1.5 Hr	98.75	14.92	83.35	14.29	81.30	5.09	<0.001*	<0.001*	<0.001*	0.302
2 Hr	95.00	13.60	80.30	10.87	80.45	5.74	<0.001*	<0.001*	<0.001*	0.964
2.5 Hr	90.35	15.85	80.55	10.60	79.00	6.41	0.014*	0.032*	<0.001*	0.588
3 Hr	89.13	16.20	81.33	6.41	77.25	3.86	0.005*	0.005*	<0.001*	0.278
Overall	88.46	9.51	82.27	4.11	80.78	6.65	0.003*	0.011*	0.005*	0.399

Table 3: Showing MAP (mmHg) among various groups at different intervals of time										
Time		Group X		Group Y		Group Z		P-value		
Interval	Me an	SD	Me an	SD	Me an	SD	Over all	X vs Y	X vs Z	Y vs Z
BL	74.95	7.72	74.65	4.57	74.20	5.49	0.926	0.876	0.697	0.816
5 Min	77.75	12.05	75.40	5.22	73.00	4.53	0.182	0.358	0.066	0.348
10 Min	78.35	9.90	74.80	4.56	73.35	3.75	0.016	0.061	0.058	0.493
15 Min	77.90	10.03	75.70	5.68	74.55	3.58	0.310	0.322	0.134	0.604
20 Min	78.30	7.96	77.00	2.10	75.75	3.96	0.108	0.439	0.074	0.183
25 Min	85.05	12.62	82.00	14.36	78.45	2.35	0.489	0.389	0.059	0.129
30 Min	86.80	13.89	84.25	14.53	81.45	1.82	0.533	0.492	0.082	0.102
45 Min	94.35	13.65	77.35	6.43	73.80	3.04	<0.001*	<0.001*	<0.001*	0.212
1 Hr	97.65	14.51	77.85	4.79	76.25	10.19	<0.001*	<0.001*	<0.001*	0.635
1.5 Hr	97.45	14.56	78.20	17.37	76.40	5.37	<0.001*	0.003*	<0.001*	0.752
2 Hr	95.90	14.97	76.85	8.80	75.40	4.66	<0.001*	<0.001*	<0.001*	0.660
2.5 Hr	85.70	13.29	75.10	5.28	74.40	3.62	<0.001*	<0.001*	<0.001*	0.796
3 Hr	80.00	12.39	72.75	4.73	72.53	2.33	0.015*	0.012*	0.011*	0.939
Overall	85.40	7.19	77.07	3.59	75.35	2.08	<0.001*	<0.001*	<0.001*	0.072

Baseline oxygen saturation (%) was statistically non significant between the three groups ($p = 0.472$). Intraoperative oxygen saturation and Postoperative Oxygen saturation (%) was statistically non significant between the three groups ($p = 0.738$) (Table 4).

Patients in group X, on an average received 2.6 ± 0.598 intraoperative fentanyl boluses, group Y received 0.5 ± 0.513 intraoperative fentanyl boluses and group Z received 0.3 ± 0.470 intraoperative fentanyl boluses. The

statistical difference between the groups was significant ($p = <0.0001$). For group X, 4.6 ± 2.21 hours was time required for rescue analgesia, 7.8 ± 4.38 hours for group Y and 10.7 ± 10.7 hours for group Z. The statistical difference between the groups was significant ($p = <0.0001$). Group X, on an average received 3.3 ± 0.444 rescue analgesic doses, group Y recieved 1.3 ± 0.733 doses and group Z recieved 1.1 ± 0.510 doses respectively. The statistical difference between the groups was significant ($p = <0.0001$) (Table 5).

Table 4: Comparison based on SPo2 among various groups at various intervals of time							
Time Interval	Group X		Group Y		Group Z		P-value
	Mean	SD	Mean	SD	Mean	SD	
BL	96.80	1.82	96.80	2.46	96.15	1.31	0.472
5 Min	98.25	1.16	98.65	1.42	97.95	1.05	0.201
10 Min	99.15	0.81	99.05	0.76	98.85	1.00	0.327
15 Min	99.10	0.91	98.90	0.85	98.70	0.92	0.376
20 Min	99.10	0.79	99.05	0.94	99.15	0.59	0.923
25 Min	99.15	0.75	98.85	0.75	98.70	0.80	0.175
30 Min	99.01	0.65	99.00	0.92	98.85	0.67	0.770
45 Min	99.05	0.76	99.15	1.04	99.15	0.37	0.895
1 Hr	99.40	0.88	98.95	0.76	99.35	0.49	0.111
1.5 Hr	99.15	0.75	99.10	0.79	99.15	0.59	0.968
2 Hr	99.45	0.76	99.25	0.91	99.40	0.50	0.677
2.5 Hr	99.20	0.70	99.15	0.67	99.15	0.37	0.954
3 Hr	99.31	0.60	99.19	1.11	99.47	0.52	0.621
Overall	98.94	0.71	98.85	0.85	98.76	0.52	0.738

In group X, 2 patients had features of nausea and no patient in group Y and group Z had nausea. The statistical difference between the groups was insignificant ($p=0.126$). 2 patients in group X had features of pruritis, 3 patients in group Y and 5 patients in group Z. The statistical difference between the groups was insignificant ($p=0.455$).

None of our study patients had wound infection (Table 6).

Evaluation of intraoperative pain by using Standard VAS revealed wide variations throughout study period, with Group Z showing lower VAS scores compared to Group Y and Group X. Throughout intraoperative and postoperative period comparison between values was statistically significant ($p<0.0001$) (Table 7).

Table 5 : Rescue Analgesia

Parameters	Group X	Group Y	Group Z	P-value			
				X vs Y	X vs Z	Y vs Z	
Fentanyl boluses	2.6±0.598	0.5±0.513	0.3±0.470	<0.001*	<0.001*	0.238	
Time to first rescue analgesic (Hours)	4.6±2.21	7.8±4.38	10.7±10.7	<0.001	<0.001	0.124	
No. of rescue analgesic doses	3.3±0.444	1.3±0.733	1.1±0.510	<0.001*	<0.001*	0.238	

Table 6: Side Effects

Parameters	Group X	Group Y	Group Z	P-value
Nausea	2	0	0	-
Pruritis	2	3	5	0.455
Wound Infection	0	0	0	-

Table 7: Showing VAS Score of various groups at various intervals of time

Time Interval	Group X		Group Y		Group Z		P-value			
	Mean	SD	Mean	SD	Mean	SD	Overall	X vs Y	X vs Z	Y vs Z
0 Hr	0.40	1.23	0.10	0.31	0.15	0.49	0.438	0.232	0.318	0.841
2 Hr	2.65	3.00	0.65	1.84	0.40	1.23	0.003*	0.005*	0.002*	0.715
4 Hr	2.25	2.34	0.35	1.14	0.20	0.41	<0.001*	<0.001*	<0.001*	0.756
6 Hr	2.95	3.02	1.70	1.95	1.20	1.77	0.043*	0.043*	0.020*	0.497
8 Hr	2.55	2.87	0.75	1.65	1.20	1.24	0.020*	0.007*	0.041*	0.489
12 Hr	2.75	2.61	1.05	2.01	1.45	1.61	0.036*	0.014*	0.039*	0.553
16 Hr	2.75	2.40	1.40	2.14	1.10	1.37	0.028*	0.039*	0.012*	0.640
20 Hr	3.10	2.95	1.60	1.31	1.05	1.76	0.010*	0.030*	0.003*	0.417
24 Hr	2.70	2.52	0.85	1.69	1.10	1.65	0.009*	0.005*	0.014*	0.693
Overall	2.45	0.60	0.94	0.34	0.87	0.27	<0.001*	<0.001*	<0.001*	0.841
0 Hr	0.40	1.23	0.10	0.31	0.15	0.49	0.438	0.232	0.318	0.841
2 Hr	2.65	3.00	0.65	1.84	0.40	1.23	0.003*	0.005*	0.002*	0.715
4 Hr	2.25	2.34	0.35	1.14	0.20	0.41	<0.001*	<0.001*	<0.001*	0.756
6 Hr	2.95	3.02	1.70	1.95	1.20	1.77	0.043*	0.043*	0.020*	0.497
8 Hr	2.55	2.87	0.75	1.65	1.20	1.24	0.020*	0.007*	0.041*	0.489
12 Hr	2.75	2.61	1.05	2.01	1.45	1.61	0.036*	0.014*	0.039*	0.553
16 Hr	2.75	2.40	1.40	2.14	1.10	1.37	0.028*	0.039*	0.012*	0.640
20 Hr	3.10	2.95	1.60	1.31	1.05	1.76	0.010*	0.030*	0.003*	0.417
24 Hr	2.70	2.52	0.85	1.69	1.10	1.65	0.009*	0.005*	0.014*	0.693
Overall	2.45	0.60	0.94	0.34	0.87	0.27	<0.001*	<0.001*	<0.001*	0.841

DISCUSSION

From a total number of 96 patients enrolled in the study, one patient each in Groups X and Y was excluded because of short surgical procedure due to inoperable growths, third patient from Group X was excluded because epidural procedure could not be established, one patient from Group Y and two from Group Z were also excluded due to blockade of the epidural catheter due to precipitation of the study drug. So finally 90 patients were involved and divided into three groups, 30 each in Group X, Y and Z.

Demographic data like age, ASA status and weight of the patients was statistically comparable between the three groups. There was statistically nonsignificant difference in baseline heart rate, oxygen saturation and mean arterial pressure among the three groups before performing the epidural block. Mean heart rate and mean arterial pressure remained significantly lower in Group Y and Group Z as compared to Group X from 45 minutes to 3 hours after giving epidural medication.

The cumulative intraoperative fentanyl¹ requirements given by the I.V. route was significantly lower in Group Y and Group Z as compared to Group X, however it was comparable between Group Y and Group Z. The time to first analgesic requirement was significantly prolonged in Group Z as compared to Group Y and Group X with a $P <$

There was also significant reduction in tramadol consumption in Group Z compared to Group Y and Group X during the first 24 h with a P value of < 0.01 . The VAS scores were significantly lower in Group Y and Group Z as compared to Group X.

The exact mechanism of the analgesic effect produced by dexamethasone is still not fully understood. Corticosteroids are capable of inhibiting phospholipase A 2 and the expression of cyclo-oxygenase-2 during inflammation, therefore reducing prostaglandin synthesis, which in turn suppresses the hyperalgesia associated with acute noxious stimuli during surgery.³

The addition of dexamethasone to local anesthetics injected during peripheral nerve blocks significantly prolonged the duration of these blocks. Adding dexamethasone to bupivacaine significantly prolonged the duration of intercostal blocks in animal as well as human studies.^{4,5} When added to lidocaine, dexamethasone prolonged the duration of axillary brachial plexus blockade.⁶ The

duration of interscalene and supraclavicular brachial plexus blocks were also prolonged by the addition of dexamethasone.^{7,8,9} In the pediatric age group it was found that adding dexamethasone to ropivacaine during peritonsillar infiltration led to reduced postoperative pain after tonsillectomy and adenoidectomy.¹¹

Thomas and Beevi reported that the preoperative epidural administration of dexamethasone, with or without bupivacaine, reduced postoperative pain and exerted an opioid-sparing effect after laparoscopic cholecystectomy.¹¹ Khafagy et al found that an epidural bupivacaine-dexamethasone mixture had almost the same analgesic potency as bupivacaine-fentanyl, with the added advantage of decreased postoperative nausea and vomiting.¹² Jo et al found that the administration of dexamethasone epidurally, whether preoperatively or postoperatively, reduced pain and analgesic requirements after radical subtotal gastrectomy.¹³ Similarly, Naghipour et al showed that the addition of dexamethasone significantly prolonged the duration of epidural analgesia.¹⁴

We found that the incidence of postoperative nausea was significantly less in all the groups and none of the study subjects had vomiting in postoperative period. This is in agreement with several previous studies which showed that dexamethasone decreases the incidence of PONV.¹⁵ Dexamethasone, a corticosteroid with a powerful anti-inflammatory action, has been used successfully for prophylaxis against PONV.¹⁶

The mechanism by which glucocorticoids decrease PONV is not fully understood, but this effect is most probably centrally mediated through the inhibition of prostaglandin synthesis or inhibition of endogenous opioids release.¹⁷ Wang et al showed that epidural administration of dexamethasone reduces the incidence and severity of post-epidural backache following hemorrhoidectomy, although postoperative pain was not specifically evaluated in that clinical trial.¹⁸ In a study of 500 hemorrhoidectomy patients who received epidural dexamethasone 5 mg demonstrated no adverse effects over a three-day follow-up period. In contrast Maillefert et al found that a much larger dose of epidural dexamethasone (15 mg) may induce transient adrenal suppression.¹⁹ In this study though we have not evaluated adrenal suppression as a side effect but several studies have been done where dexamethasone doses in a

range of 4 to 12 mg have been used and no significant side effects have been seen so far.²⁰

SUMMARY

The patients were comparable with respect to age, weight, sex, ASA status and baseline cardiorespiratory parameters like mean arterial pressure, heart rate, respiratory rate and oxygen saturation. Increased dose of dexamethasone from 6mg to 10mg significantly increased the duration of analgesia as the time taken to 1st top-up analgesic was significantly increased in group Z compared to other groups. Group Z had significantly low VAS score as compared to Group X and Group Y.

There was no significant variation in SpO₂ between the three groups and the three groups were comparable and stable. Pulse rate and mean arterial pressure was significantly lower in Group Z as compared to Group X and Group Y.

There was no significant difference between the three groups regarding nausea and wound infection.

Limitations of the study

Since pain is a subjective phenomenon with wide variability of responses among the individuals, it is difficult to standardize the variable. Pain that may be tolerable for one person may be intolerable for another person. It may be difficult to assess and grade the pain thus producing lot of unwanted bias in the study.

CONCLUSION

Dexamethasone is safe adjuvant in epidural anesthesia. Dexamethasone in increased dose as an adjunct to ropivacaine increases the duration of analgesia without increasing the side effects.

Conflict of interest: Nil

Financial Sources: Nil

REFERENCES

- Oates JD, Snowdown SL, Jayson DW: Failure of pain relief after surgery : attitudes of ward staff and patients to postoperative analgesia: *Anaesthesia*, 1994; 49: 755-58.
- Abram SE, Marsala M, Yaksh TL: Analgesic and neurotoxic effects of intrathecal corticosteroids in rats: *Anesthesiology*, 1994;81:11981205.3. Ebersberger A, Grubb BD, Willingale HL, Gardiner NJ, Nebe J, Schaible HG: The intraspinal release of prostaglandin E₂ in a model of acute arthritis is accompanied by an up-regulation of cyclooxygenase-2 in the spinal cord: *Neuroscience*, 1999;93:775781.
- Dräger C, Benziger D, Gao F, Berde CB. Prolonged intercostal nerve blockade in sheep using controlled release of bupivacaine and dexamethasone from polymer microspheres. *Anesthesiology* 1998;89:969979.
- Kopacz DJ, Lacouture PG, Wu D, Nandy P, Swanton R, Landau C. The dose response and effects of dexamethasone on bupivacaine microcapsules for intercostals blockade (T9 to T11) in healthy volunteers. *Anesth Analg*, 2003;96:576582.
- Movafegh A, Razazian M, Hajimaohamadi F, Meysamie A. Dexamethasone added to lidocaine prolongs axillary brachial plexus blockade. *Anesth Analg*, 2006;102:263267.
- Vieira PA, Pulai I, Tsao GC, Manikantan P, Keller B, Connelly NR. Dexamethasone with bupivacaine increases duration of analgesia in ultrasound-guided interscalene brachial plexus blockade. *Eur J Anesthesiol*, 2010;27:285 288
- Parrington SJ, O'Donnell D, Chan VWS, Brown-Shreves D, Subramanyam R, Qu M, et al. Dexamethasone added to mepivacaine prolongs the duration of analgesia after supraclavicular brachial plexus blockade. *Reg Anesth Pain Med*, 2010; 35:422426.
- Biradar PA, Kaimar P, Gopalakrishna K. Effect of dexamethasone added to lidocaine in supraclavicular brachial plexus block: a prospective, randomised, double-blind study. *Indian J Anesth*, 2013;57:180184.
- Ju NY, Cui GX, Gao W. Ropivacaine plus dexamethasone infiltration reduce postoperative pain after tonsillectomy and adenoidectomy. *Int J Pediatr Otorhinolaryngol*, 2013;77:18811885.
- Thomas S, Beevi S. Epidural dexamethasone reduces postoperative pain and analgesic requirements. *Can J Anesth*, 2006; 53(9):899-905.
- Khafagy HF, Refaat AI, El-Sabae HH, Youssif MA. Efficacy of epidural dexamethasone versus fentanyl on postoperative analgesia. *J Anesth*, 2010;24(4):531

13. Jo YY, Yoo JH, Kim HJ, Kil HK. The effect of epidural Administration of dexamethasone on postoperative pain: a randomized controlled study in radical subtotal gastrectomy. *Korean J Anesthesiol*, 2011; 61: 233-237.
14. Naghipour B, Aghamohamadi D, Azarfarin R, Mirinazhad M, Bilehjani E, Abbasali D, et al. Dexamethasone added to Bupivacaine prolongs duration of epidural analgesia. *Middle East J Anesthesiol*, 2013; 22: 53-57.
15. Eberhart LH, Morin AM, Georgieff M. Dexamethasone for prophylaxis of postoperative nausea and vomiting. A meta analysis of randomized controlled studies. *Anesthesist* 2000; 49: 713-720.
16. Gan TJ, Meyer T, Apfel CC, Chung F, Davis PJ, Eubanks S, et al. Consensus guidelines for managing post operative nausea and vomiting. *Anesth Analg*, 2003; 97: 62-71.
17. DeOliveira GS Jr, Castro-Alves LJ, Ahmad S, Kendall MC, McCarthy RJ. Dexamethasone to prevent postoperative nausea and vomiting: an updated meta-analysis of randomized controlled trials. *Anesth Analg*, 2013; 116: 58-74.
18. Wang YL, Tan PP, Yang CH, Tsai SC, Chung HS. Epidural dexamethasone reduces the incidence of backache after lumbar epidural anesthesia. *Anesth Analg*, 1997; 84: 376-8. 19. Maillefert JF, Aho S, Huguenin MC, Chatard C, Peere T, Marquignon MF, Lucas B, Tavernier C. Systemic effects of Epidural dexamethasone injections. *Rev Rhum Eng l'Ed*. 1995, Jun; 62(6): 429-32.
20. Wang YL, Tan PP, Yang CH, Tsai SC, Chung HS. Epidural dexamethasone reduces the incidence of backache after lumbar epidural anesthesia. *Anesth Analg*, 1997; 84: 376-8.