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Comparison of Perioperative Anaesthesia using Epidural Ropivacaine, Ropivacaine with Clonidine and Ropivacaine with Dexmeditomedine in Abdominal Hysterectomies

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Abstract

Background: *General Anesthesia or Regional anesthesia (Spinal/Epidural) is the technique used for Abdominal Hysterectomy surgeries. Regional anesthesia is preferred for lower abdominal surgeries. Local anaesthetics used commonly are Lignocaine, Bupivacaine & Ropivacaine. Clonidine and Dexmeditomedine are α2-adrenoreceptor agonists with anxiolytic and dose-related sedative properties. In addition to above properties, they provide good analgesia devoid of respiratory depression and good adjuncts to local anaesthetics.*

Aim

1. *To compare the clinical effects of epidural Dexmedetomidine and epidural Clonidine when used as adjuvant to epidural Ropivacaine*
2. *To find out the time of first epidural top up.*
3. *To find the number of analgesic requirement until the time of first epidural top up.*

Materials And Methods

This study was conducted after obtaining approval of institutional technical committee and Human Ethical committee of Government Medical College Trivandrum.

Study design: *Prospective cohort study*

Study setting: *Government Medical College Trivandrum.*

120 patients were selected and divided into 3 groups randomly. First group received Ropivacaine alone(R), second Ropivacaine plus Clonidine(RC) and third group Ropivacaine plus Dexmeditomedine(R).

Inclusion Criteria

- *Patients undergoing elective Abdominal Hysterectomy*
- *(ASA) I & II*
- *Age 30 – 60 years*
- *Weight 40 – 80 kg*
- *Height 145 – 165 cm*

Exclusion Criteria

- *Patient refusal*
- *Patients on sympathomimetics, sympatholytic or anticholinergic drugs*
- *Known hypersensitivity to Dexmedetomidine/clonidine/local anaesthetics*

Materials & Methods

All patients were examined the day before surgery, procedure explained, written informed consent obtained from the patient and relative. Fasting for 8 hours was advised. Tab. Ranitidine 50 mg and Tab Metoclopramide 10mg was given on the night and at 6am on the day of surgery.120 patients who met the inclusion criteria were allocated to 3 groups A, B and C.

- Patients were secured with good intravenous access and preloaded with 500ml Normal saline 15 min before surgery.On arrival in the operating room, monitors such as Pulseoximetry (SPO2), Electrocardiogram (ECG), Noninvasive blood pressure (NIBP) were attached and baselines values recorded.
- Patient was placed in lateral decubitus position and administered epidural block at L3 – L4 space with 18G Touhy needle and catheter was secured 4cms into epidural space and test dose of 3ml of 2% lignocaine hydrochloride solution containing adrenaline (1:2,00,000 dilution)injected. After 3 minutes following negative aspiration for blood,
- Group R : Received 17ml of 0.75% Ropivacaine
- Group RC: Received 16ml of 0.75% Ropivicaine + 2mcg per Kg Clonidine.
- (diluted to 1ml with normal saline)
- Group RD: Received 16ml of 0.75% Ropivicaine + 1.5mcg per Kg Dexmedetomedine (diluted to 1ml with normal saline)
- The bilateral pin-prick method with 26G needle to evaluate and check the sensory level & Bromage scale for motor block at 5,10,15,20 minutes are noted.

Bromage scale

0. No block
1. Inability to raise extended legs
2. Inability to flex knee
3. Inability to flex ankle & foot

Time of onset of sensory block level at T6, peak sensory block level, grading of motor blockade, regression of analgesic level to S1 dermatome and time to complete recovery were recorded. The quality of block evaluated according to the need for supplementary analgesia.

a) adequate epidural – no supplementary analgesia required
b) inadequate epidural—Supplementation of 5ml of .75% ropivacaine required to complete surgery
c) failed epidural—General Anaesthesia required to complete surgery

Ramsay sedation scale for sedation score was used.

1. Patient is anxious and agitated or restless or both.
2. Patient is cooperative, oriented an tranquil.
3. Patient responds to commands only.
4. Patient has a brisk response to a light glabellar tap or loud auditory stimulus.
5. Patient asleep, sluggish response to light glabellar tap or loud auditory stimulus.
6. Patient doesn't respond to painful stimulus.

- Heart rate, blood pressure, O2 saturation were monitored continuously and recordings were made every 2 minutes for 20min till the surgery is started and at 5 min interval till the surgery is completed.
- The onset of pain is managed by top up doses of 8ml of 0.2% Ropivacaine(as a rescue analgesic) in the postoperative period.
- The time to first top up and sedation scores are noted every 15 min until patient complains of pain.

Comparision of post operative block characteristics

- Mean time to 2 segment regression
- Mean time for regression to Bromage 1
- Mean time sensory regression at S1
- Time to first epidural top-up

Any side effects like hypotension (defined as systolic arterial pressure falling more than 20%of baseline) was noted and treated with Inj. Mephenteramine 3-6mg in bolus doses and bradycardia (heart rate <50 bpm) noted and treated with 0.3 – 0.6mg of atropine.

Observations and Results

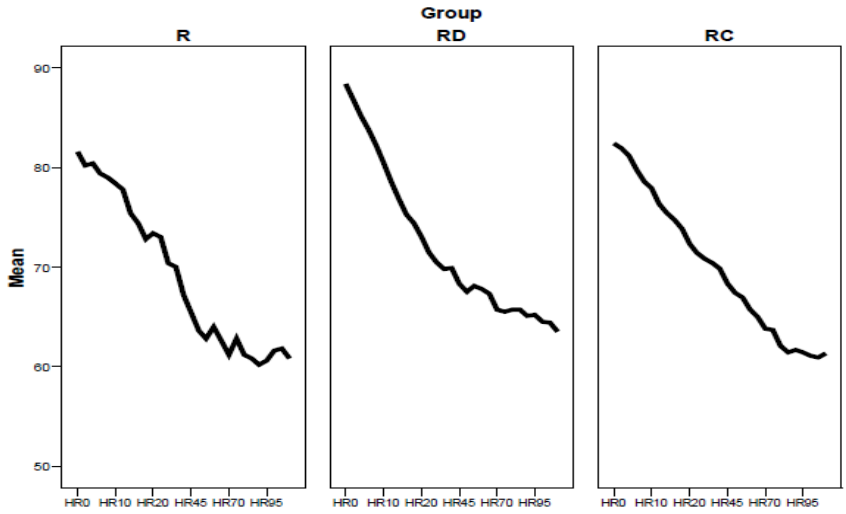
The observations made were tabulated and analyzed using computer software, Statistical Package for Social Sciences. Mean, Standard error, One way Anova and Bonferroni were used to compare quantitative variables. Qualitative variables were compared using Chi-Square Tests. The patients in three groups were comparable with respect to age, sex, weight and ASA PS. 2 patients from group R, 4 patients from group RD and 1 patient from group RC were converted to GA.

Comparison of Age, Weight, ASA Among Groups

The mean age, ASA, bodyweight and duration of surgery were comparable among groups R, RD and RC& had no statistical significance.

PARAMETERS	GROUP R	GROUP RD	GROUPRC	P VALUE
AGE (YRS)	42.85±4.897	44.44±4.453	44.13±8.203	.242
WEIGHT (KG)	51.40±5.163	51.82±5.231	51.00±4.324	.263
ASA	1.18±.385	1.26±.442	1.20±.401	.657
DURATION OF SURGERY	95.88±13.723	99.36±10.710	100.73±10.097	.158

Comparison of Heart Rate During Surgery



	R		RD		RC		Between Group Differences (P value)		
TIME INTERVAL	MEAN	SD	MEAN	SD	MEAN	SD	R vs RD	R vs RC	RC vs RD
0 min	86.20	7.894	84.51	7.214	81.29	6.687	.305	.003	.050
2 min	84.93	7.409	82.92	6.876	80.56	6.519	.203	.005	.131
4 min	84.23	7.574	81.49	6.731	79.61	6.693	.085	.004	.234
6 min	83.65	7.364	80.31	6.646	78.37	6.811	.035	.001	.214
8 min	82.88	7.377	79.08	6.599	77.32	6.868	.017	.000	.260
10 min	81.70	8.256	77.85	6.722	76.34	6.762	.020	.001	.358
12 min	81.15	8.755	76.85	6.226	75.27	6.645	.010	.000	.336
14 min	79.93	8.278	75.74	6.189	73.98	6.385	.009	.000	.262
16 min	79.40	8.776	74.49	6.142	73.12	6.626	.003	.000	.403
18 min	78.75	7.964	73.77	5.774	72.59	6.742	.002	.000	.444
20 min	77.85	8.024	72.59	5.893	71.32	6.517	.001	.000	.410
25 min	77.28	8.308	71.31	6.083	70.32	6.413	.000	.000	.529

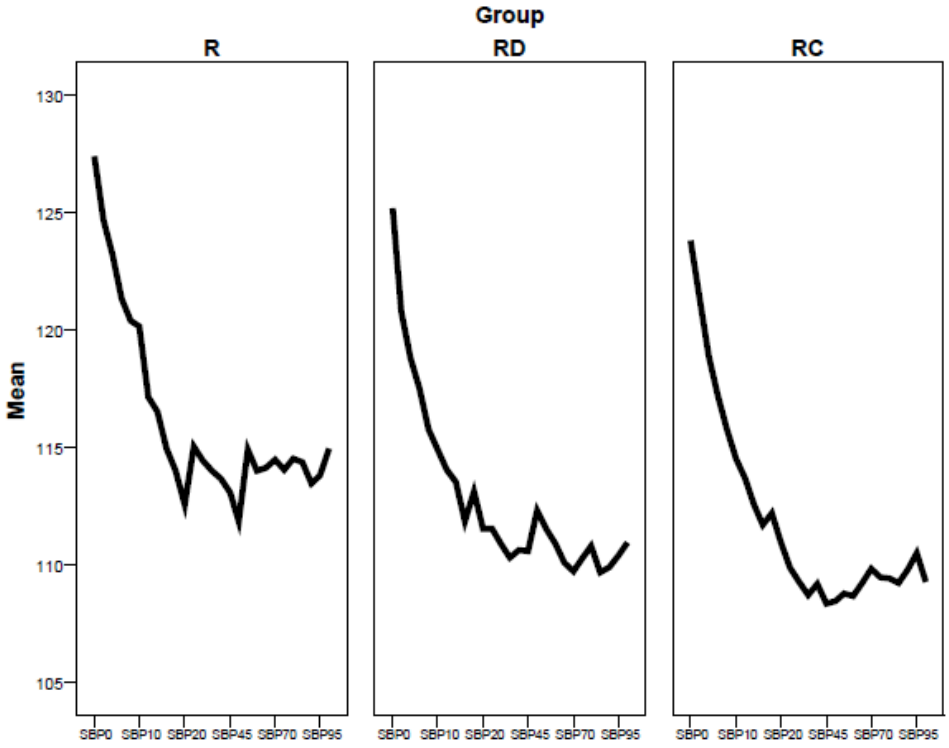
30 min	75.55	8.724	70.10	6.257	69.46	6.562	.001	.000	.695
35 min	74.63	8.292	69.41	6.684	69.02	6.883	.002	.001	.814
40 min	73.85	8.304	68.77	6.960	68.29	6.951	.003	.001	.775
45 min	73.55	8.302	67.72	7.536	67.44	7.145	.001	.000	.871
50 min	71.72	8.961	67.08	7.865	66.46	7.103	.011	.004	.733
55 min	71.68	8.182	66.54	7.170	65.90	7.361	.003	.001	.708
60 min	71.25	7.715	65.82	7.089	64.93	7.333	.001	.000	.590
65 min	70.88	8.510	65.23	7.256	64.22	7.367	.002	.000	.560
70 min	71.03	8.795	64.10	6.863	63.54	7.567	.000	.000	.746
75 min	70.62	8.623	63.69	6.542	63.22	6.803	.000	.000	.774
80 min	69.64	8.689	63.23	6.834	62.18	7.179	.000	.000	.537
85 min	69.74	7.815	62.30	7.318	61.68	7.220	.000	.000	.715
90 min	68.58	6.927	61.78	7.368	60.87	7.030	.000	.000	.584
95 min	68.81	7.694	61.75	8.527	61.03	6.905	.001	.000	.709
100 min	68.80	7.031	61.09	7.257	60.56	6.001	.000	.000	.789
105 min	66.00	6.423	63.00	8.410	60.38	5.679	.035	.072	.354
110 min	60.80	6.301	63.50	7.322	61.33	6.155	.465	.881	.453
115 min	63.50	6.403	72.67	8.622	61.40	5.320	.100	.644	.043
120 min	66.33	1.528	66.00	5.657	61.25	6.702	.948	.259	.344

There was statistically significant difference noted at time intervals 0,2,4,6,8,10,12,14, 16,18,20,25,30,35,40,45,50,55,60,65,70,75,80,85, 90,95,100 min(with P value<0.05) when compared between groups R & RC.

There was statistically significant difference noted at time intervals 6,8,10,12,14,16,18,20,25,30,35, 40,45,50,55,60,65,70,75,80,85,90,95,100,105 min (with P value<0.05) when compared between groups R & RD.

There was no significant difference between groups RD & RC.There was fall in heart rate in all groups.

Comparison of Systolic Blood Pressure during Surgery

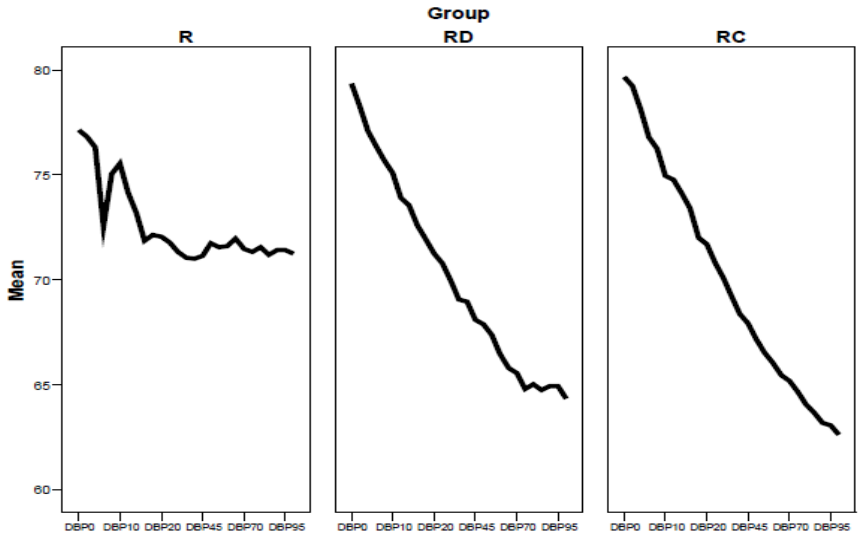


	R		RD		RC		Between groups P value		
TIME INTERVAL	MEAN	SD	MEAN	SD	MEAN	SD	R vs RD	R vs RC	RC vs RD
0 min	126.93	8.983	124.92	9.435	125.15	7.650	.309	.360	.909
2 min	124.05	10.658	121.23	10.582	123.10	8.843	.215	.671	.408
4 min	121.98	11.639	118.54	11.505	120.93	8.987	.158	.662	.323
6 min	119.73	12.896	116.10	10.992	118.95	8.826	.147	.752	.250
8 min	117.93	13.016	114.79	10.131	117.46	8.758	.199	.847	.270
10 min	117.63	12.434	113.15	10.176	116.07	8.816	.063	.510	.219
12 min	115.28	11.574	112.38	10.412	114.68	8.051	.206	.792	.311
14 min	115.05	11.041	111.59	10.151	113.68	8.389	.123	.536	.347
16 min	114.48	11.008	110.44	10.610	112.90	7.864	.073	.476	.268
18 min	113.58	10.675	111.51	10.733	112.73	7.887	.365	.717	.580
20 min	112.23	10.669	109.64	10.333	111.51	8.183	.242	.743	.394
25 min	114.20	10.166	110.38	10.078	110.78	8.132	.077	.108	.852
30 min	113.98	9.499	110.18	10.560	110.29	7.827	.074	.079	.957
35 min	113.38	9.385	109.79	9.448	109.34	8.263	.081	.047	.823
40 min	112.90	9.204	109.74	9.544	109.85	8.284	.122	.131	.957
45 min	112.48	8.608	110.05	8.793	109.39	8.215	.210	.107	.730
50 min	112.23	9.744	111.28	9.344	109.34	8.199	.646	.157	.343
55 min	113.73	9.706	110.62	8.792	109.80	8.223	.124	.050	.685
60 min	113.48	9.769	110.64	9.001	109.41	7.739	.158	.042	.538
65 min	113.45	9.182	110.41	9.086	109.73	8.056	.127	.059	.730
70 min	113.93	9.344	110.18	8.571	110.27	8.322	.060	.063	.964
75 min	113.68	10.212	110.18	8.808	110.39	7.687	.090	.107	.916
80 min	114.72	9.665	110.41	8.264	110.95	7.968	.033	.060	.782
85 min	114.66	9.415	109.42	8.703	109.95	8.136	.013	.022	.791
90 min	114.19	9.631	110.94	9.039	110.61	7.600	.134	.093	.869
95 min	113.81	9.095	110.11	9.523	111.08	8.439	.134	.241	.667
100 min	114.95	9.599	110.95	10.621	109.28	8.653	.178	.050	.553
105 min	113.89	9.571	114.25	9.762	109.38	7.512	.927	.252	.182
110 min	111.20	9.524	114.30	10.177	109.58	6.082	.508	.721	.203
115 min	116.50	8.185	114.33	11.590	107.20	6.221	.741	.130	.271
120 min	117.33	1.155	115.00	13.748	108.50	5.747	.740	.205	.338

There was significant difference with p value < 0.05 noted at time intervals 35min,60 min between groups R & RC, 80 min between groups R & RD,85 min between groups R & RD and R & RC.

There was fall in Systolic blood pressure in groups RD & RC than group R.

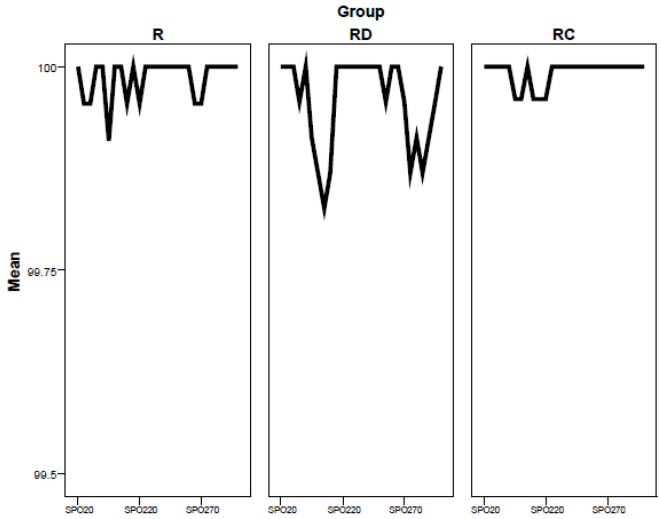
Comparison of Diastolic Blood Pressure during Surgery



	R		RD		RC		Between groups P value		
TIME INTERVAL	MEAN	SD	MEAN	SD	MEAN	SD	R vs RD	R vs RC	RD vs RC
0 min	78.43	6.122	80.00	4.323	79.71	2.804	.132	.213	.777
2 min	77.60	5.237	78.97	4.368	79.00	3.033	.158	.146	.979
4 min	77.25	5.363	77.62	4.417	77.88	3.084	.711	.520	.789
6 min	75.25	12.002	76.82	4.334	76.76	2.981	.358	.372	.970
8 min	76.20	4.298	76.13	4.390	75.85	2.886	.935	.691	.754
10 min	76.25	4.436	75.41	4.470	74.63	3.006	.355	.073	.390
12 min	74.90	4.695	74.08	4.239	74.20	3.516	.382	.449	.889
14 min	74.50	4.793	73.44	4.447	73.49	3.529	.272	.290	.957
16 min	73.08	5.465	72.51	4.358	72.76	3.678	.584	.753	.812
18 min	73.70	5.331	72.00	4.478	71.49	3.880	.103	.032	.619
20 min	73.63	4.861	71.10	4.471	70.90	3.980	.013	.007	.841
25 min	73.55	5.306	70.88	4.970	70.20	4.167	.002	.003	.913
30 min	73.08	5.437	69.36	4.955	69.40	4.260	.001	.001	.960
35 min	72.83	5.449	69.10	5.325	68.54	4.342	.001	.000	.618
40 min	72.55	5.524	68.77	5.494	67.83	4.795	.002	.000	.427
45 min	72.55	5.124	68.00	5.685	67.44	4.544	.000	.000	.626
50 min	73.08	5.091	67.87	6.216	67.00	4.599	.000	.000	.466
55 min	72.63	4.754	67.36	5.532	66.44	4.561	.000	.000	.409
60 min	72.45	4.982	66.77	5.788	66.05	4.685	.000	.000	.534
65 min	72.50	5.223	66.28	5.862	65.51	4.313	.000	.000	.506
70 min	72.13	5.369	66.13	6.127	65.24	4.570	.000	.000	.464
75 min	71.49	5.820	65.82	6.244	64.73	4.533	.000	.000	.383
80 min	71.36	6.091	65.85	6.414	64.53	4.397	.000	.000	.304
85 min	71.40	6.016	65.58	6.703	64.35	4.475	.000	.000	.353
90 min	71.16	5.235	65.74	6.844	63.74	4.746	.000	.000	.134
95 min	71.54	5.109	65.50	6.818	63.61	5.145	.000	.000	.192
100 min	71.23	5.255	64.32	6.066	62.60	4.610	.000	.000	.273
105 min	71.89	6.585	63.50	6.389	61.69	3.497	.002	.000	.419
110 min	69.40	6.693	64.20	6.443	61.25	3.596	.090	.009	.213
115 min	69.50	8.226	63.00	6.928	60.80	5.541	.736	.272	1.000
120 min	70.67	7.024	63.33	6.429	61.00	6.377	.644	.288	1.000

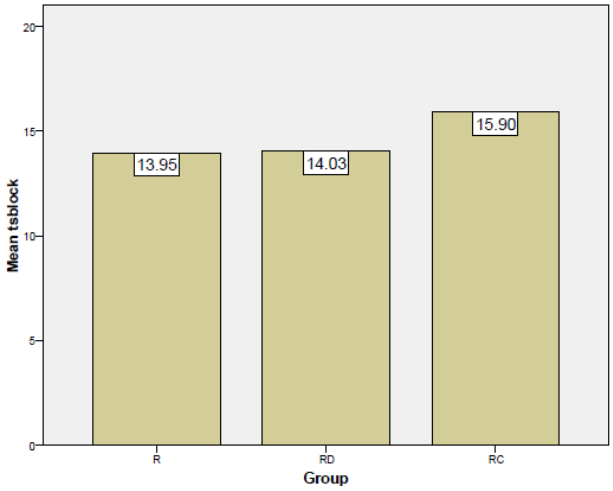
There was significant difference with p value<0.05 noted at 20,25,30,35,40,45,50,55, 60,65,70,75,80,85,90,95,100 and 105 min between groups R & RD,R & RC respectively. There was fall in diastolic blood pressure in both group RD & RC than group R.

Comparison of Spo2 Between Groups

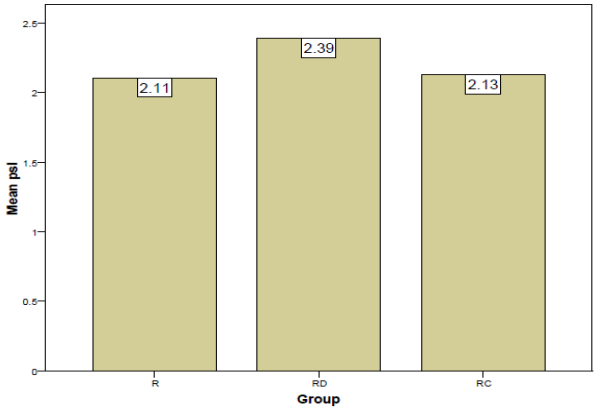


There was a slight fall in SPO2 in group RD than group R & RC.

Comparison of Time of Onset Of Sensory Block At T6



Onset of sensory block at T6 is the time interval between the administration of epidural block and sensory block at T6 dermatome. There was no significant difference when compared between group R and RD. There was significant difference with P value<0.05 when compared between groups R and RC, group, groups RD & RC. Peak Sensory Level – P value between groups

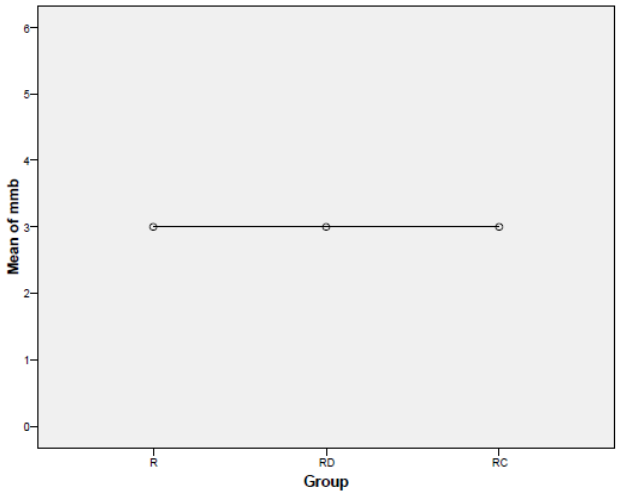


The peak sensory level was comparable between groups .It was 2.11±1.008 in group R,2.39±.934 in group RD,2.13±1.005 in group RC.

There was no significant difference between the groups.

The maximum sensory level attained is T4.

Comparison of Maximum Motor Blockade



Variable	Group R	Group RD	Group RC
Time to maximum motor blockade	3.00±.000	3.00±.000	3.00±.000

All the 113 patients achieved modified bromage scale 3.

There was no significant difference between groups.

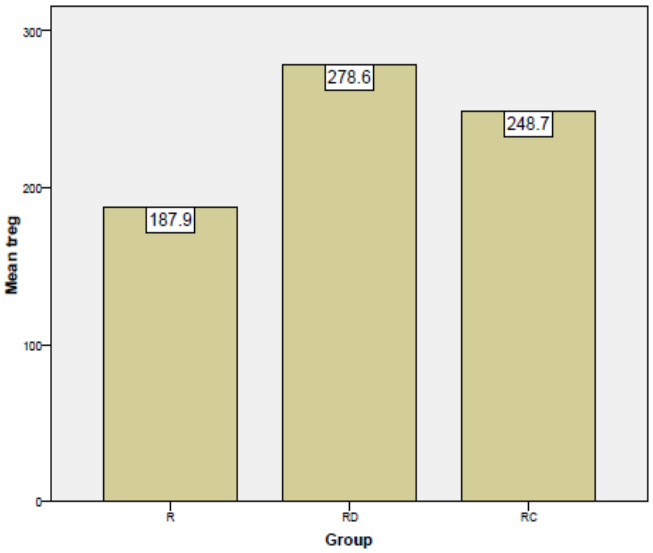
Comparison of Time of Regression to Bromage 1

Variable	Group R	Group RD	Group RC
Time of regression to Bromage 1	201.05±32.615	310.28±14.038	265.90±33.381

GROUPS COMPARED	P value
R & RD	.000
R& RC	.000
RD & RC	.000

The time of regression to Bromage scale 1 was significantly prolonged in group RD than group RC and R.

Comparison of Time to two Segment Regression



Variables	GROUP R	GROUP RD	GROUP RC
Time of 2 segment regression	187.89±29.606	278.61±35.629	248.72±34.196

GROUPS COMPARED	P VALUE
R & RD	.000
R & RC	.000
RD & RC	.000

There was significant difference between groups with P value of .000

It was significantly prolonged in group RD followed by group RC and then group R.

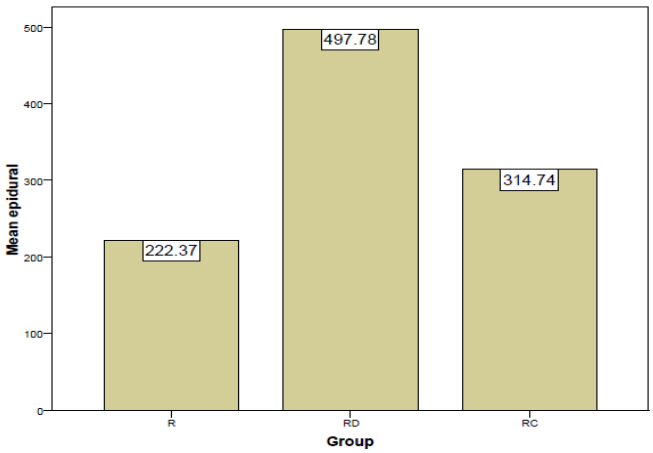
Comparison of Regression of Analgesic Level to S1 Dermatome

Variable	Group R	Group RD	Group RC
Time of regression to S1 dermatome	223.68±41.617	495.83±60.681	313.97±34.682

GROUPS	P VALUE
R & RD	.000
R & RC	.000
RD & RC	.000

There was significant difference between groups with P value .000.It was significantly prolonged in group RD followed by group RC and then group R.

Comparison of First Epidural Top up



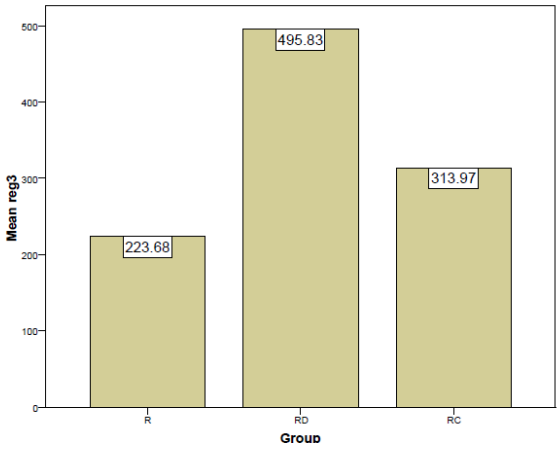
Variable	Group R	Group RD	Group RC
Time of first epidural topup	222.37±41.942	497.78±61.788	314.74±34.469

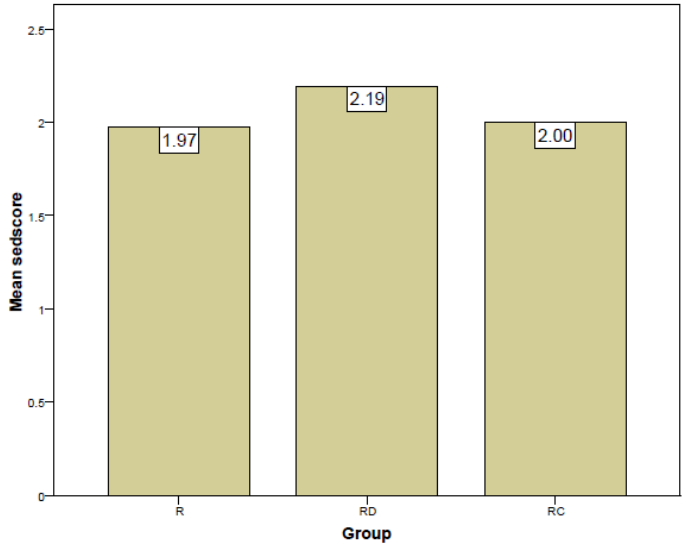
Groups compared	P value
R & RD	.000
R & RC	.000
RD & RC	.000

There was statistically significant difference between groups with P value of .000.

It was significantly prolonged in group RD than group RC & R.

Comparison of Sedation Score





Groups compared	P value
R & RD	.006
R & RC	.734
RD & RC	.014

Sedation score was better in group RD than group RC and group R.

There was statistically significant difference when compared between groups R & RD,groups RD & RC.

Comparison of Adverse Effects

Adverse effects	Group R	Group RD	Group RC
Nausea	0	0	0
Vomiting	0	0	0
Shivering	0	0	0
Dryness of mouth	0	4	7

Incidence of hypotension and bradycardia

Hypotension was noted in 12 patients from group R,11 patients from group RD and 11 patients from group RC and treated with 6mg of Mephenteramine.

Bradycardia was noted in 2 patients from group R &RD,1 patient from group RC. It was treated with 0.6mg Atropine.

There was no analgesic requirement till first epidural top up.

Discussion

Neuraxial opioids are standard analgesics for postoperative pain management. The use of alpha2 agonist such as Clonidine has several advantages over epidurally administered opioids as it is devoid of side effects such as pruritus, nausea, vomiting, respiratory depression and urinary retention. In addition, Clonidine have synergistic action when used as adjuvant to local anesthetic resulting in reduced postoperative analgesic requirement.[93,94]

Paech et al[95] have demonstrated that postoperative epidural analgesia was significantly prolonged by the use of Clonidine as adjuvant to Bupivacaine-Fentanyl mixture.

Eisenach et al[96] found that Clonidine significantly decreased the pain caused by ice water immersion, decreased plasma noradrenaline levels and caused haemodynamic changes.But there was intense sedation lasting upto 6 hours.

Various studies have shown that use of dexmedetomidine reduces perioperative analgesic requirements[97,98] and provides opioid sparing effect with minimal adverse effects.

Epidural administration of these drugs are associated with anxiolysis, sedation, analgesia, sympatholysis. Clonidine has already been used successfully for epidural analgesia and the introduction of Dexmedetomidine has further widened the use of alpha2 agonists in regional anesthesia.

The stable haemodynamics with sedation and prolonged postoperative analgesia makes these alpha2 agonists, an effective adjuvant in regional anesthesia.

- Sukhminder Jit Singh Bajwa et al compared the efficacy and clinical profile of Dexmedetomidine and Clonidine in combination with Ropivacaine in epidural anesthesia for vaginal hysterectomies.[85]
- In our study, the patients in three groups were comparable with respect to age, weight and ASA PS, duration of surgery.

The clinical parameters such as heart rate, systolic blood pressure, diastolic blood pressure were compared. There was fall in systolic blood pressure and diastolic blood pressure in both groups RD & RC. There was fall in heart rate in all groups.

The onset of sensory block at T6 was compared between groups. There was significant difference with P value<0.05 when compared between groups R and RC, groups RD and RC.

The next parameter compared was maximum sensory level achieved. (T4). There was no significant difference between the groups.

The maximum motor blockade was compared between groups. There was no significant difference between groups.

The evolution of motor blockade was done by Bromage scale. All the 113 patients attained Bromage scale 3.

Postoperative block characteristics such as the time of regression to Bromage scale 1 was compared. There was significant difference found between all the groups with P value<0.05.

The time of two segment regression was compared between groups.It was comparable and significant difference was found between groups with P value<0.05.

The time of regression of sensory level to S1 dermatome was compared. It was comparable and significant difference found between groups with P value<0.05.

The time of first epidural topup was compared between groups. It was statistically significant with P value of <0.05.It was prolonged in group RD followed by group RC and group R.

Sedation score was compared between groups by Ramsay sedation scale. No significant difference between groups.

Comparison of adverse effects such as nausea, vomiting, shivering, dryness of mouth was noted. There was no incidence of nausea, vomiting and shivering. Dryness of mouth was noted in 4 patients from group RD and 7 patients from group RC.

Conclusion

Epidural Dexmedetomidine and Clonidine have synergistic action in combination with epidural Ropivacaine resulting in smooth and prolonged postoperative analgesia and sedation.

Group RD had significant difference in comparison of postoperative block characteristics such as time of two segment regression, time to bromage scale 1,time of regression to S1 dermatome and time of first epidural topup than group RC & R.

Thus, epidural Dexmedetomidine is a better neuraxial adjuvant than epidural Clonidine in combination with epidural Ropivacaine for abdominal hysterectomy.

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