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RESEARCH ARTICLE
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COMPARISON BETWEEN DEXAMETHASONE AND DEXMEDETOMIDINE AS AN ADJUVANT IN TRANSVERSE ABDOMINAL PLANE (TAP) BLOCK FOR POSTOPERATIVE ANALGESIA IN PATIENTS OF CAESAREAN SECTION

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ABSTRACT

Background: Patients usually suffer from significant pain after caesarean section, with the major source of pain being the anterior abdominal wall and the abdominal viscera. [1] These patients require a multimodal postoperative treatment regimen that provides high-quality analgesia with minimal side effects. The Transversus
Abdominis Plane (TAP) block is a regional anaesthesia technique that targets the sensory nerve supply of the antero-lateral abdominal wall and has been proven as an effective method to reduce postoperative pain and analgesic consumption for caesarean section surgeries in various clinical trials. [2,3] Various adjuvant has been used to intensify the quality and prolong the local anaesthetic effect. [4,5]

Objective:

1) To compare Dexamethasone and Dexmedetomidine as adjuvant to local anaesthetic in TAP Block for postoperative analgesia in patients with caesarean section.
2) To assess the time for the first request of analgesia

Methodology: The study was a Randomised Control Trial done in the Department of Anaesthesiology and the Department of Obstetrics and Gynaecology of Government Medical College and Hospital, Akola. The study was performed over a time period of 16 months (October 2022 to February 2024). The total sample size taken was 100 (50 in each group) with the help of Randomisation (lottery method). Group A received a total of 40 mL of Inj Bupivacaine hydrochloride 0.25% + 2 mL Dexamethasone (8 mg). Group B received a total of 40 ml of Inj Bupivacaine hydrochloride 0.25% + 0.5 mcg/kg of Dexmedetomidine (Max Bupivacaine dose- 2mg/kg in both cases). The total dose was divided into two parts to be given on each side, equally.

Result: The study found that Dexmedetomidine was more effective when compared to Dexamethasone in providing better outcomes in terms of VAS scores and duration of the analgesia. The mean time of request for first analgesia in the Dexmedetomidine group was significantly greater (19.66 hrs) than in the Dexamethasone group (12.10 hrs).

Conclusion: Overall, the study proved that Dexmedetomidine was more effective when compared to Dexamethasone when added as an adjuvant with better outcomes in VAS scores and duration of the analgesia.

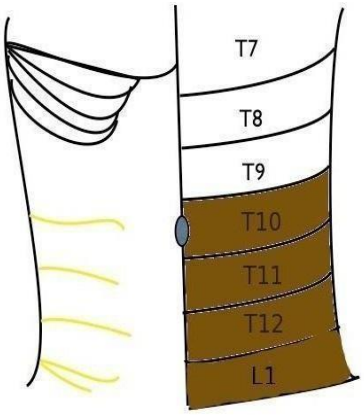
Keywords: TAP, Dexamethasone, Dexmedetomidine, VAS score.

Introduction

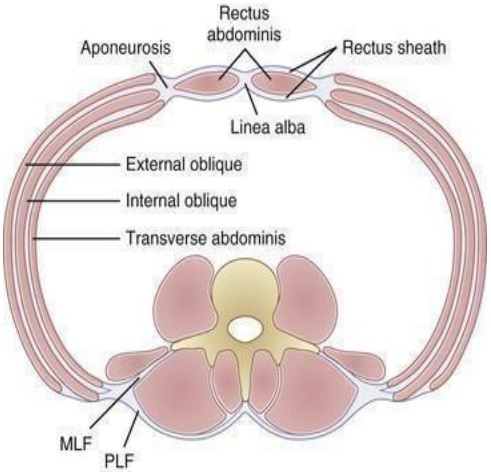
The TAP anatomical compartment is a plane that is located between the internal oblique and Transversus Abdominis muscles and contains the T6 to L1 thoracolumbar nerves which will result in the interruption of innervations to abdominal skin, muscles and parietal peritoneum. [2,3,10] The description of the landmark technique for performing TAP block advocated a single-entry point, the Triangle of Petit, to access a number of abdominal wall nerves hence providing more widespread analgesia. It is bound anteriorly by the external oblique muscle, posteriorly by the latissmus dorsi and inferiorly by iliac crest which forms the base of the triangle. When a blunt needle is pierced, there are two pop sounds. The first one is when external oblique is pierced and the second is on piercing the internal oblique. After the second pop, the drug is placed in Transverse Abdominis plane

The innervations of the antero-lateral abdominal wall arise from the anterior rami of spinal nerves T7 to L1. These include-

1. The intercostal nerves (T7-T11)
2. The subcostal nerve (T12)
3. The iliohypogastric and ilioinguinal nerve (L1).



Cutaneous innervation of the abdominal wall . Coloured region is mostly blocked by a single injection posterior TAP block.



Various adjuvant has been used to intensify the quality and prolong the local anaesthetic effect. [4,5] Dexamethasone, through its anti-inflammatory and blocking effects on neural discharge, and nociceptive C fibers transmission could be used as a local anaesthetic adjuvant.[6]

On the other hand, Dexmedetomidine is also a potential adjuvant to local anaesthetic in TAP block. The spinal and peripheral analgesic mechanisms of DEX could be contributed to its highly selective affinity to alpha-2 adrenergic receptor (α2AR).[7] DEX has an effect on Pre- synaptic neuronal receptors and reduces nor-epinephrine release at peripheral afferent nociceptors.[8] Furthermore, some evidence indicated that DEX played an inhibitory role with K+ current and Na+ current, which resulted in a reduction in neuronal activity.[9]

AIM-

To compare Dexamethasone and Dexmedetomidine as an adjuvant in Transverse Abdominal Plane Block for post-operative analgesia in patients of caesarean section.

OBJECTIVES-

1) To compare Dexamethasone and Dexmedetomidine as adjuvant to local anaesthetic in TAP Block for postoperative analgesia in patients with caesarean section.
2) To assess the time for the first request of analgesia.

METHODOLOGY

STUDY DESIGN:

The study is a Randomized Control Trial

STUDY SETTING:

The study was conducted in the Department of Anaesthesiology and the Department of Obstetrics and Gynaecology of Government Medical College and Hospital, Akola, Maharashtra.

STUDY DURATION:

The present study was performed over a time period of 16 months (October 2022 to February 2024)

SAMPLE SIZE:

The study of **Nitika Singla, et al**.[17] observed that the mean time to initial self-reporting of post-operative pain was significantly prolonged in Dexmedetomidine group (411.00 ± 143.35 min) than in Dexamethasone group (338.20 ± 196.13 min) with *P* value = 0.001. Taking these values as reference, the minimum required sample size with 95% Confidence Interval and 80% power of study came as 38 in each group. To reduce margin of error, the total sample size taken was 100 (50 in each group)

SAMPLING METHOD:

Randomization (Lottery method) was followed in the present study. 50 chits with
Dexmedetomidine and 50 chits with Dexamethasone were made and were mixed in a bowl. The patients after meeting the inclusion criteria and signing of the consent paper were asked to pick the chit and were allotted to the group accordingly.

SELECTION CRITERIA:

Inclusion criteria-

1) Patients who gave consent for the study
2) ASA class I and II
3) Elective as well as Emergency caesarean Section
4) Age group 18-35 years
5) Non obese pregnant females
6) Caesarean delivery via a Joel Cohen/ Pfannenstiel incision
7) Patients receiving Subarachnoid block for caesarean section.

Exclusion criteria-

1) Patients who didn’t give consent
2) Allergy to local anaesthetic
3) Local skin infection
4) Altered coagulation profile
5) Patients with Pre-Eclampsia and Eclampsia
6) Patients with co-morbid diseases
7) Patients having any other contraindications to Sub Arachanoid block.

DATA ANALYSIS:
The data was analysed using SPSS software v23.0. The level of significance was kept at 5%. The two groups' age was compared using an Independent t test. Comparison of systolic blood pressure, diastolic blood pressure, pulse rate, SpO2 and VAS score between the two groups was done using Independent t test. Comparison of time of request for first anaesthesia between the two groups was also done using Independent t test.

ETHICAL DECLARATION:
Ethical clearance was taken from the Institutional Ethics Committee (IEC) prior to the commencement of the study.

CONSENT:
Written, informed and valid consent was obtained in regional language from all the study participants.

STUDY PROCEDURE:
Steps of giving TAP Block-
At the end of the surgery, a 23 G Quincke needle was taken which was blunted and was connected to a syringe which contained the local anaesthetic. Group A received a total of 40 mL of Inj Bupivacaine hydrochloride 0.25% + 2 mL Dexamethasone (8 mg). Group B received a total of 40 ml of Inj Bupivacaine hydrochloride 0.25% + 0.5 mcg/kg of Dexmedetomidine (Max Bupivacaine dose-2mg/kg in both cases). The total dose was divided into two parts to be given on each side, equally.
After cleaning and draping the skin, Triangle of Petit was identified. The needle was introduced in the mid axillary line, at the midpoint of sub costal margin superiorly and iliac crest inferiorly, absolutely perpendicular to the skin. Once the skin barrier was breached, the needle tip was withdrawn back so that the tip lies just under the skin. The needle was then advanced forward till the first 'pop' sensation was felt. That occurred when External oblique was punctured and now the needle lied in the plane between External oblique and Internal oblique. Further advancement of the needle resulted in a second 'pop' sensation which occurred when the needle pierced through the Internal oblique muscle and it now lied in the plane between Internal oblique and Transverse Abdominis muscle. At this point, after careful aspiration, the drug was injected. The same technique was repeated on the other side. Pain was measured in both the groups by Visual analogue scale (VAS)at 2,4, 8, 12, 16, 20, 24 hours. Time for first request of rescue analgesia was also noted.
No additives were added in spinal anaesthesia to prolong its action. Plain Inj Bupivacaine 0.5% (heavy) was used for spinal.

STUDY OUTCOMES:
- Baseline vitals (BP, HR, SPO2) were noted before giving block, immediately after block and then at 2, 4, 8, 12, 16, 20 and 24 hours.
- Similarly, VAS score was also assessed at 2, 4, 8, 12, 16, 20 and 24 hours and the time for request of rescue analgesia was noted. (fig 4)
- Any complications, if found, were also documented.

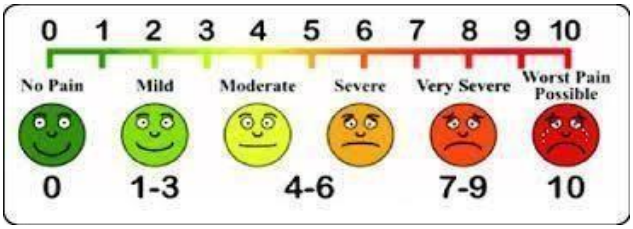


Fig: Visual analogue scale

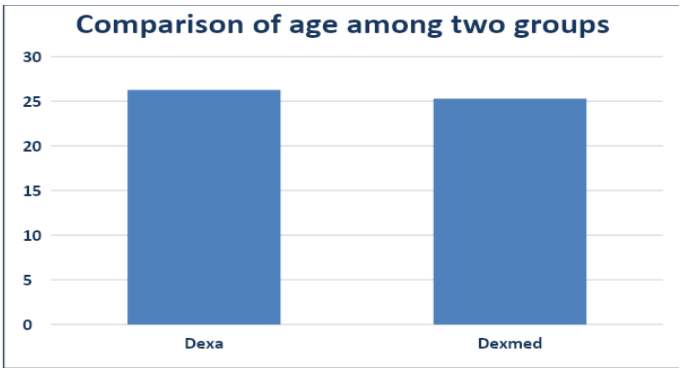
RESULTS

I. Comparison of age in both the groups

The table presents the age details of the study participants. The mean age of the study subjects in Dexamethasone group was 26.28 ± 3.15 and in the Dexmedetomidine group was 25.30 ± 2.82 years, with p value = 0.105 which was not significant.

Group	Mean	SD	t value	p value
Dexamethasone (A)	26.28	3.15		
Dexmedetomidine (B)	25.30	2.82	1.637	0.105

Table 1: Comparison of age in both the groups



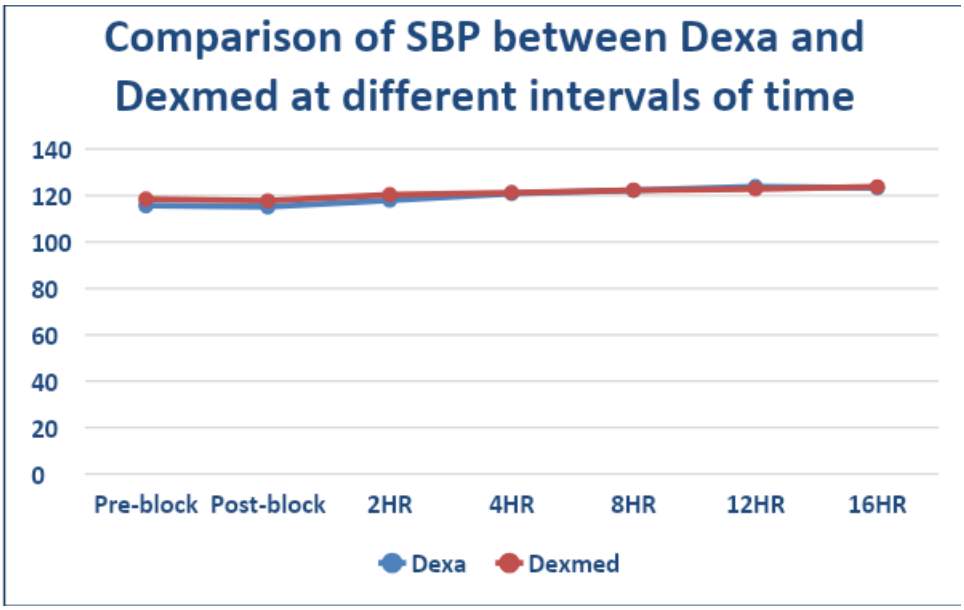
Graph 1: Comparison of age in both the groups

II. Comparison of Systolic BP between the two groups

The table compares the Systolic BP between Dexamethasone and Dexmedetomidine at different time intervals. Starting from the pre-block period, there was a non-significant difference between the two groups regarding the systolic blood pressure measured at each interval.

	Dexamethasone		Dexmedetomidine			
Interval	**Mean**	**SD**	**Mean**	**SD**	**Difference**	**p-value**
Pre-block	115.60	10.71	118.44	10.48	-2.84	0.183
Post-block	115.08	8.02	117.68	8.90	-2.60	0.128
2HR	118.00	6.66	120.32	6.17	-2.32	0.074
4HR	120.88	6.62	121.28	6.24	-0.40	0.757
8HR	122.20	6.59	122.32	4.65	-0.12	0.916
12HR	123.79	6.66	122.84	3.98	0.95	0.487
16HR	123.33	5.16	123.75	4.20	-0.42	0.824

Table 2: Comparison of Systolic BP between Dexamethasone and Dexmedetomidine groups at different intervals of time



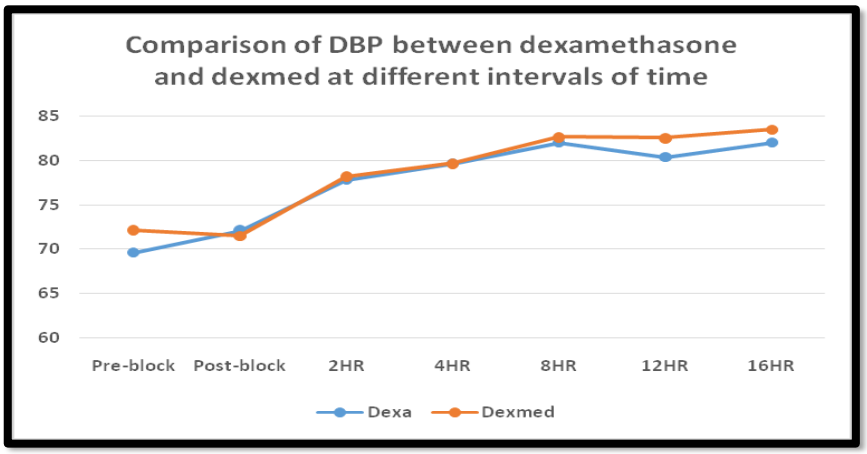
Graph 2: Systolic BP in Dexamethasone and Dexmedetomidine groups at different intervals of time

III. Comparison of Diastolic BP between the two groups

Table 3 compares the Diastolic BP between Dexamethasone and Dexmedetomidine at different time intervals. Starting from the pre-block period, there was a non-significant difference between the two groups regarding the diastolic blood pressure measured at each interval.

Interval	Dexa Mean	SD	Dexmed Mean	SD	Difference	p-value
Pre-block	69.60	8.58	72.16	6.66	-2.56	0.099
Post-block	72.08	7.70	71.52	5.29	-0.44	0.740
2HR	77.84	4.71	78.20	5.63	-0.36	0.730
4HR	79.68	5.26	79.64	4.86	-0.04	0.969
8HR	82.00	5.53	82.60	4.75	-0.60	0.562
12HR	80.35	5.34	82.52	4.88	-2.17	0.069
16HR	82.00	1.26	83.46	4.14	-1.46	0.078

Table 3: Comparison of Diastolic BP between Dexamethasone and Dexmedetomidine at different intervals of time



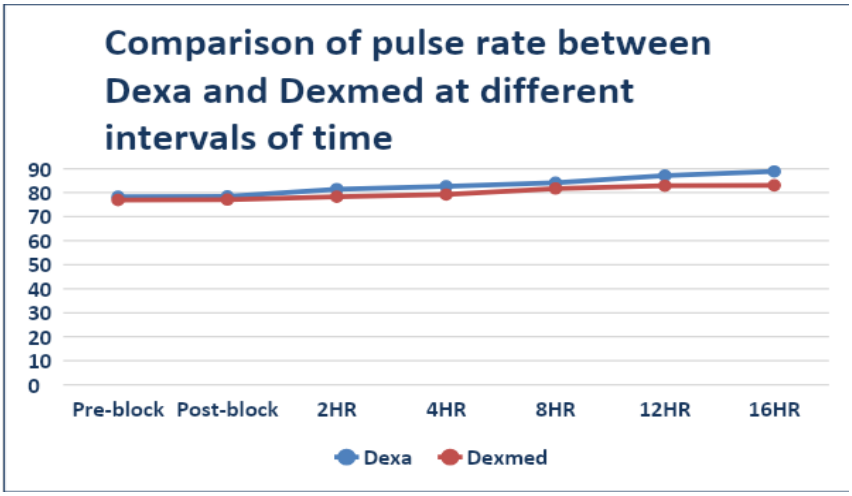
Graph 3: Comparison of Diastolic BP between Dexamethasone and Dexmedetomidine at different intervals of time

IV. Comparison of pulse rate between two groups

Table 4 compares the pulse rate between Dexamethasone and Dexmedetomidine at different time intervals. Starting from the pre-block period, there was a non-significant difference between the two groups regarding the pulse rate measured at each interval except at the 12- hour interval where the pulse rate in the Dexamethasone group was significantly greater than in the Dexmedetomidine group.

Interval	Dexa		Dexmed		Difference	p-value
	Mean	SD	Mean	SD		
Pre-block	78.28	10.46	76.94	11.02	1.34	0.534
Post-block	78.46	10.13	77.14	10.63	1.32	0.527
2HR	81.48	9.19	78.28	9.31	3.20	0.087
4HR	82.66	8.52	79.22	9.46	3.44	0.059
8HR	84.12	8.17	81.74	8.83	2.38	0.165
12HR	87.10	7.37	82.86	8.18	4.24	0.024*
16HR	88.83	7.65	83.06	7.52	5.77	0.083

Table 4: Comparison of pulse rate between Dexamethasone and Dexmedetomidine at different intervals of time



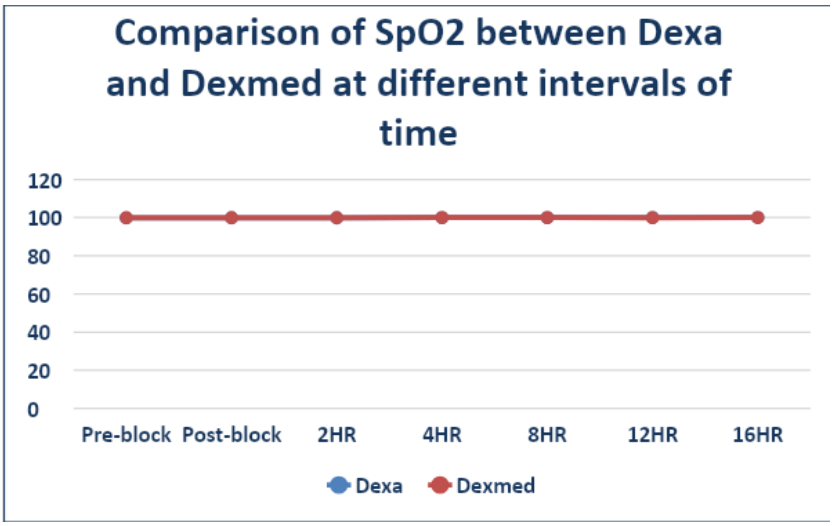
Graph 4: Comparison of pulse rate between Dexamethasone and Dexmedetomidine at different intervals of time

V. Comparison of SpO2 between two groups

Table 5 compares the SpO_2 between Dexamethasone and Dexmedetomidine at different time intervals. Starting from the pre-block period, there was a non-significant difference between the two groups regarding the SpO_2 measured at each interval.

Interval	Dexa		Dexmed		Difference	p-value
	Mean	SD	Mean	SD		
Pre-block	99.82	0.39	99.94	0.24	-0.12	0.066
Post-block	99.88	0.33	99.94	0.24	-0.06	0.299
2HR	99.88	0.33	99.90	0.30	-0.02	0.752
4HR	99.98	0.14	100.00	0.00	-0.02	0.320
8HR	99.98	0.14	100.00	0.00	-0.02	0.320
12HR	100.00	0.00	99.94	0.24	0.06	0.183
16HR	100.00	0.00	100.00	0.00	0.00	.

Table 5: Comparison of SpO_2 between Dexamethasone and Dexmedetomidine at different intervals of time



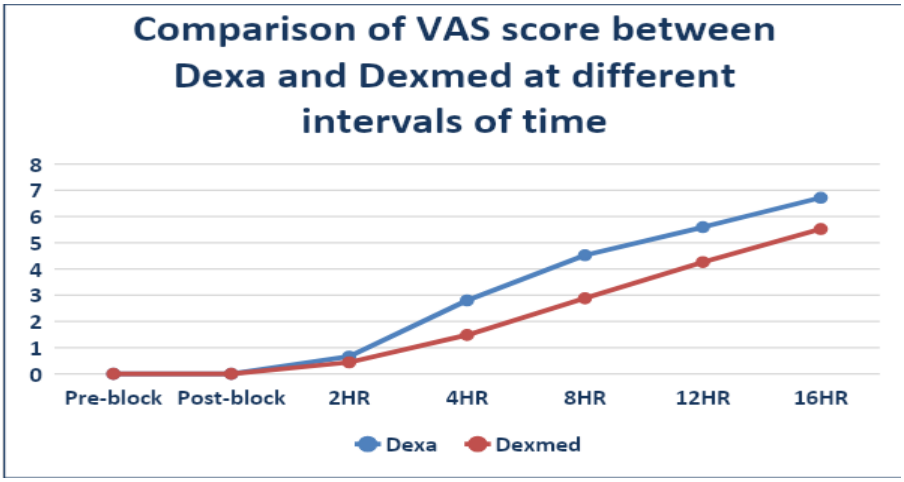
Graph 5: Comparison of SpO_2 between Dexamethasone and Dexmedetomidine at different

VI. Comparison of VAS score between two groups

Table 6 compares the VAS score between Dexamethasone and Dexmedetomidine at different time intervals. At the pre-block period, post-block period and 2 hrs after, there was a non- significant difference between the two groups regarding the VAS score. However, thereafter till 16 hrs, the mean VAS score in the Dexmedetomidine group was significantly lower than in the Dexamethasone group.

Interval	Dexamethasone		Dexmedetomidine		Difference	p-value
	Mean	SD	Mean	SD		
Pre-block	0.00	0.00	0.00	0.00	0.00	--
Post-block	0.00	0.00	0.00	0.00	0.00	--
2HR	0.66	0.69	0.44	0.61	0.22	0.094
4HR	2.80	1.03	1.48	0.74	1.32	<0.001*
8HR	4.52	1.20	2.88	0.80	1.64	<0.001*
12HR	5.59	1.18	4.26	0.83	1.33	<0.001*
16HR	6.71	0.76	5.52	0.85	1.19	0.001*
20HR	.	.	6.46	0.71	.	.
24HR	.	.	7.00	1.00	.	.

Table 6: Comparison of VAS score between Dexamethasone and Dexmedetomidine at different intervals of time



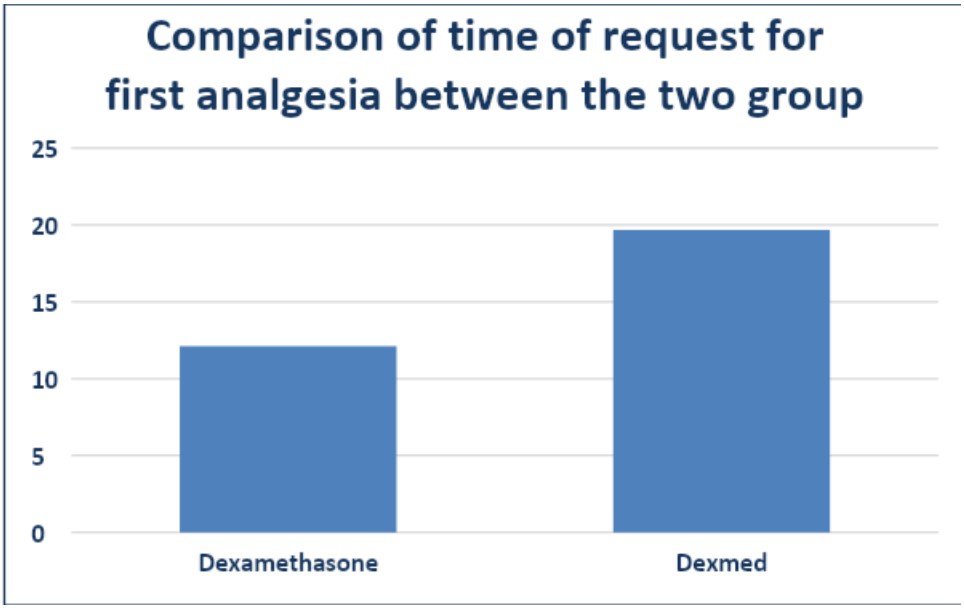
Graph 6: Comparison of VAS score between Dexamethasone and Dexmedetomidine at different intervals of time

VI. Comparison of the time of request for first analgesia between two groups

Table 7 compares the time of request for first analgesia (in hours) between Dexamethasone and Dexmedetomidine groups. The mean time of request for first analgesia in the Dexmedetomidine group was significantly greater (19.66 hrs) than in the Dexamethasone group (12.10 hrs).

Group	Mean	SD	Difference	p-value
Dexamethasone	12.10	2.60	-7.56	<0.001*
Dexmedetomidine	19.66	2.52		

Table 7: Comparison of time of request for first analgesia between the two groups



Graph 7: Comparison of time of request for first analgesia between the two groups

DISCUSSION

Post-operative pain following caesarean surgeries is mainly because of somatic and visceral components. Surgical trauma of tissues due to surgical incision leads to somatic pain whereas visceral pain is mainly due to inflammation. [17] These patients require a multimodal postoperative treatment regimen that provides high-quality analgesia with minimal side effects. [25]

The Transversus Abdominis Plane (TAP) block is an easily operated nerve block to control pain after abdominal surgery, particularly among patients undergoing caesarean surgery. [26] Several authors have highlighted that TAP block after caesarean section reduces the analgesic requirement in the first 24 h. [27, 28] TAP block inhibits the neural afferents from T7-L1 leading to somatic pain antagonism. [3]

TAP block is a multifaceted block, which works through local field effects leading to distal effects causing far spread of local anaesthetic. [34] Unfortunately, TAP block with plain local anaesthetics (LA) has a relatively short duration of action.

Hence, various adjuvant drugs have been used to intensify the quality and prolong the local anaesthetic effect. [4,5] Dexamethasone, and Dexmedetomidine are some of the potential adjuvant to local anaesthetic in TAP block.

In the present study, the mean age of the study subjects in the Dexamethasone group was 26.28 ± 3.15, while in the Dexmedetomidine group was 25.30 ± 2.82 years, with p value = 0.105 which was not statistically significant.

Systolic BP between Dexamethasone and Dexmedetomidine groups were measured at different time intervals in the present study: pre block, post block, 2 hrs, 4hrs, 8 hrs, 12 hrs, 16 hrs, 20 hrs and 24 hrs. We found that starting from the pre-block period, there was a statistically non-significant difference between the two groups regarding the systolic pressure measurements. Similar results were

found in the study by **Thakur et al**., [16] where they divided 120 patients in three group- Group B (receiving Bupivacaine alone in TAP block), Group BDX (receiving Dexamethasone along with Bupivacaine) and Group BDM (receiving Dexmedetomidine along with Bupivacaine) where there was no statistical difference between the systolic BP in BDM and BDX group. On the other hand, it was observed in study by **Sinha Jyoti et al** that the systolic BP at different time intervals (1^{st}, 3^{rd}, 6^{th}, 12^{th}, 18^{th} and 24^{th} hr) after the TAP block was lower in the Dexmedetomidine group as compared to Dexamethasone group. This can be attributed to the anxiolytic and sympatholytic properties of Dexmedetomidine.

Similarly, Diastolic BP between Dexamethasone and Dexmedetomidine groups were also measured at pre block, post block, 2 hrs, 4hrs, 8 hrs, 12 hrs, 16 hrs, 20 hrs and 24 hrs and we found non statistical difference between the diastolic BP of both the group at each interval. Similar results were seen with **Thakur et al** study. [16] in which they observed that diastolic BP was more in B group compared to BDM and BDX but no statistical difference was seen between diastolic BP of BDM and BDX. This further reiterates the fact that addition of Dexamethasone and Dexmedetomidine to LA gives better analgesia and hemodynamic stability in patients.

In the present study, the pulse rate between Dexamethasone and Dexmedetomidine showed a non-significant difference between the two groups at different intervals except at the 12-hour interval where it was significantly greater in Dexamethasone group than in the Dexmedetomidine group. This supports the finding that the VAS score in Dexamethasone was higher when compared to Dexmedetomidine which led to increase in HR in the Dexamethasone group. Similar findings were observed in **Sinha Jyothi et al study**. [14] where HR was higher in the Dexamethasone group in comparison with Dexmedetomidine group at 12^{th} hour.

In our study, at the pre-block period, post-block period and 2 hrs after, there was a non- significant difference between the two groups regarding the VAS score. However, thereafter till 16 hrs, the mean VAS score in the Dexmedetomidine group was significantly lower than in the Dexamethasone group. These results were similar to the study by **Singla et al** [17] where the VAS scores of the study subjects in the Dexamethasone group was 1.52 ± 0.50, while in the Dexmedetomidine group was 1.22 ± 0.42 and **Sinha Jyothi et al** [14] where the mean VAS scores for the initial first hour were comparable between both groups, which could be due to the residual effect of SAB; however, afterward, at 6, 9, and 12 h, VAS scores were significantly lower in the Dexmedetomidine group. This can be attributed to the fact that Dexmedetomidine in combination with Levobupivacaine prolonged the duration of analgesic action.

In the present study, the mean time of request for first analgesia in the Dexmedetomidine group was significantly greater (19.66 hrs) than in the Dexamethasone group (12.10 hrs). These are akin to the findings of **Singla et al [16]** where the time of initial self-reporting of post-operative pain was significantly less in the Dexamethasone group as compared with the Dexmedetomidine group. Also, in the study of **Thakur J et al [16]** it was seen that the total rescue analgesic demand in 24 hours was significantly lower in group BDM (2.02 ± 0.16) in comparison to group B (2.90 ± 0.31) and group BDX (2.82 ± 0.50). Another study conducted by **Ramya Parameswari A et al** to compare the efficacy of 20 ml of Bupivacaine (0.25%) with 0.5µg/kg of Dexmedetomidine and 20ml Bupivacaine (0.25%) alone for TAP block for Postoperative Analgesia in Patients Undergoing Elective Caesarean Section under spinal anaesthesia showed that the addition of Dexmedetomidine to Bupivacaine in TAP block prolonged the duration of postoperative analgesia.[39] **Elhamamy et al** compared Bupivacaine, Bupivacaine plus Dexamethasone, and Bupivacaine plus Dexmedetomidine in the TAP block and found an increased duration of pain relief in the Dexmedetomidine group, as indicated by VAS scores, which is consistent with our study. A longer time interval for the first rescue analgesia and decreased total analgesic consumption were also observed in the Bupivacaine plus Dexmedetomidine group. [29]

Sinha Jyothi et al reported that total tramadol consumption was higher in Dexamethasone group than in the Dexmedetomidine group, indicating the superiority of Dexmedetomidine in relieving postoperative pain. [14]

In the study of **Singla et al,** [17] Bradycardia and hypotension was noted in 5% of the patients in Dexmedetomidine group. This was not seen in our study.

The present study had been followed up for 24 hrs in post-op period. This period is long enough to evaluate the pain scores, patient satisfaction and other hemodynamic parameters. However, the pain score of patients were evaluated at rest and we could not monitor the analgesic requirement during movement, which is essential for these lactating patients.

In the present study, TAP block was given blindly, if Ultrasonographic assisted TAP anaesthesia would have been given, better outcomes could have been expected.

The pain thresholds and the pain expressions vary in different individuals and gender. The VAS scoring done in the first hour after surgery could be misleading as there is an inability to compare the time of analgesic onset of action between groups due to the residual effect of SAB. Moreover, VAS scoring is a subjective method which may vary from person to person and may not be reliable in highly stressful times like post-caesarean sections. To evaluate more objectively, questionnaires could have been added.

Besides these limitations, the present study has found that Dexmedetomidine is more effective when compared to Dexamethasone when added as an adjuvant with better outcomes in VAS scores and duration of the analgesia with minimal side-effects.

CONCLUSION

The TAP block is effective for multimodal postoperative analgesia in abdominal surgery. The study was primarily aimed at establishing the analgesic efficacy of TAP block in post caesarean patients with addition of adjuvant to local anaesthetics. The Transversus Abdominis Plane (TAP) block after caesarean section reduces the analgesic requirement in the first 24 h.

In the present study, two adjuvants: Dexamethasone and Dexmedetomidine were added to the local anaesthetics in the Transverse Abdominal Plane Block for post-operative analgesia in patients of caesarean section. The study found that Dexmedetomidine was more effective when compared to Dexamethasone in providing better outcomes in terms of VAS scores and duration of the analgesia.

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