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A Comparative Study of Intrathecal Dexmedetomidine and Fentanyl in Lower Abdominal Surgeries

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Abstract

Context: Fentanyl was commonly used previously but due to its short duration of analgesia and more requirements of analgesics, efficacy of dexmedetomidine was evaluated by some studies and found to be effective. *Aim:* To compare the efficacy between dexmedetomidine and fentanyl when used for patients undergoing lower abdominal surgeries *Settings and design:* Present study was hospital based comparative study carried out at Department of Anesthesiology, Malla Reddy Institute of Medical Sciences. *Methods:* 60 consecutive eligible patients undergoing surgeries for lower abdomen were divided into two groups of 30 each. First group received dexmedetomidine 5 mcg and the other group received fentanyl 25 mcg. They were compared for the time taken for sensory regression and requirement of analgesics *Statistical analysis:* Student's t test was used for mean values and chi square test for proportions. *Results:* Both the groups were comparable to each other in terms of baseline characteristics, types of surgeries performed. Mean duration of surgery was significantly more in the dexmedetomidine group than fentanyl group. The height of sensory level was significantly different between the two groups. Both the drugs took equal time of three minutes from injection to reach the highest sensory level. But the time required for sensory regression to S1 from highest sensory level was significantly higher for dexmedetomidine group patients compared to fentanyl group patients. The requirement of analgesics was significantly higher for fentanyl group compared to the dexmedetomidine group. *Conclusion:* Dexmedetomidine was found to be more effective than fentanyl in terms of long lasting anesthesia, and lesser requirement of analgesics.

Keywords: Dexmedetomidine; Fentanyl; Analgesics; Anesthesia; Regression.

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Introduction

For surgeries of the lower abdomen, the most commonly used anesthesia is the spinal anesthesia. This is because compared to general anesthesia, it is easy to give and cheaper. But all is not well with spinal anesthesia. It is associated with problem of pain after surgery. This is due to the fact that the local anesthetics used have relatively short duration of action. Therefore there is requirement to use the analgesics most of the times to relieve pain in the patients after surgery. To overcome this problem, prolonging the spinal anesthesia effect is one solution. And to achieve this, various modalities had been tried [1]. There is more frequency of side effects like vomiting, nausea and visceral pain while patients are operated for surgeries of lower abdomen using spinal anesthesia [2].

It has been found that if the fentanyl was added to hyperbaric bupivacaine then it improved the quality

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of subarachnoid block during the surgery as well as during the early periods after surgery [3].

When opioids are added to the local anesthetics, then it has been found that the patients can develop depression of the respiratory system and some can develop itching all over the body. Studies have shown that dexmedetomidine which is a new drug and highly selective α2-agonist, has been found to be effective which prolongs the duration of anesthesia and hence reduces the requirement of analgesics. It has also been found to give satisfactory results in terms of hemodynamic stability. It has minimum side effects. Moreover Food and Drug Administration has approved the use of dexmedetomidine. Studies have shown that dexmedetomidine has been effective with all above mentioned advantages in minimal dose of 5 mcg [4].

With this background we attempted to study the efficacy of dexmedetomidine over fentanyl in patients undergoing lower abdominal surgeries in our setup.

Methods

Study Design

Present study was hospital based comparative study

Study Period

The study was carried out over a period of nine months from October 2017 to June 2018

Settings

The study was carried out at Department of Anesthesiology, Malla Reddy Institute of Medical Sciences, Hyderabad.

Sample Size

Total of 60 patients undergoing lower abdominal surgeries were studied over a period of six months

Ethical Considerations

Institutional Ethics Committee Permission was obtained before the start of the study. Informed consent and high risk consent was obtained from all selected patients for the present study.

Inclusion Criteria

1. Patients undergoing lower abdominal surgeries
2. Patients willing to participate in the present study

Exclusion Criteria

1. Patients found to be suffering from serious diseases
2. Patients not willing to participate in the present study

Methodology

Sixty eligible patients as per the abovementioned inclusion and exclusion criteria were divided into two groups in equal numbers. 30 patients received 5 mcg dexmedetomidine intrathecally and were labeled as dexmedetomidine group. 30 patients received 25 mcg fentanyl intrathecally and were labeled as fentanyl group.

Baseline characteristics like age, sex, ASA grade, type of surgery undergone, duration of surgery, dose of anesthetic given, height of sensory level, time from injection to highest sensory level, time for sensory regression to S1 from the highest sensory level, requirement of analgesics, its type and dose as well as side effects at the end of the surgery were recorded in the pre designed, pre tested, and semi structured study questionnaire.

All the studied parameters were compared between the groups.

Statistical Analysis

The data was entered in the Microsoft Excel worksheet and analyzed using means and proportions. Statistical tests like student's t test was used for comparing differences of mean between the two groups.

Results

Table 1 shows comparison of baseline clinical characteristics between the two groups. Mean age, distribution of males and females and distribution of patients with ASA grades was similar in the two groups. Thus both the groups were comparable to each other.

Table 2 shows comparison of type of surgery and mean duration of surgery for patients in two groups. The types of surgeries performed for the two groups were similar and comparable. The mean duration of surgery was significantly more in the dexmedetomidine group than that of fentanyl group.

Table 3 shows comparison of height of sensory level between the two groups. The height of sensory

level was significantly different between the two groups.

Table 4 shows comparison of time for highest sensory level and sensory regression in two groups. Both the drugs took equal time of three minutes from injection to reach the highest sensory level. But the time required for sensory regression to S1 from highest sensory level was significantly higher for dexmedetomidine group patients compared to fentanyl group patients.

Table 5 shows comparison of analgesic requirement between the two groups. The requirement of analgesics was significantly higher for fentanyl group compared to the dexmedetomidine group.

Table 6 shows comparison of side effects between the two groups. Side effect like hypotension was significantly not different between the two groups. There was only one case of bradycardia in fentanyl group compared to 15 cases in the dexmedetomidine group and this difference was found to be statistically significant.

Table 1: Comparison of baseline clinical characteristics between the two groups

Clinical characteristics		Fentanyl group (N = 30)	Dexmedetomidine group (N = 30)	T value/chi square value	P value
Age (years)		37.2±7.8	35.8±8.1	0.6819	0.4980
Sex	Male	21 (70%)	17 (56.7%)	0.6459	0.4216
	Female	09 (30%)	13 (43.3%)		
ASA grade	I	24 (80%)	27 (90%)	0.5229	0.4696
	II	06 (20%)	03 (10%)		

Table 2: Comparison of type of surgery and mean duration of surgery for patients in two groups

Type of surgery done	Fentanyl group (N = 30)		Dexmedetomidine group (N = 30)		Chi square value/T value	P value
	Number	%	Number	%		
Appendicectomy	13	43.3	07	56.7	5.5	0.067206
Hernioplasty	15	50	15	50		
Laparotomy	02	6.7	08	26.7		
Mean Surgery duration (min)	86±29.2		107±42.9		2.2164	0.0306

Table 3: Comparison of height of sensory level between the two groups

Height of sensory level	Fentanyl group (N = 30)		Dexmedetomidine group (N = 30)		Chi square value	P value
	Number	%	Number	%		
T6	06	20	23	76.7	17.09	0.0001
T8	24	80	07	23.3		

Table 4: Comparison of time for highest sensory level and sensory regression in two groups

Variables	Fentanyl group (N = 30)	Dexmedetomidine group (N = 30)	T value	P value
Time required from injection to highest sensory level (min)	3	3	-	-
Time required for sensory regression to S1 from highest sensory level (min)	166±23.3	268±29.4	14.8928	0.0001

Table 5: Comparison of analgesic requirement between the two groups

Analgesic requirement	Fentanyl group (N = 30)	Dexmedetomidine group (N = 30)	T value	P value
Diclofenac (mg)	75±0	20±33.7	8.9391	0.0001
Paracetamol (mg)	1900±305.1	1200±406.8	7.5399	0.0001

Table 6: Comparison of side effects between the two groups

Side effects		Fentanyl group (N = 30)		Dexmedetomidine group (N = 30)		Chi square value	P value
		Number	%	Number	%		
Hypotension	Yes	14	46.7	18	60	0.6027	0.4376
	No	16	53.3	12	40		
Bradycardia	Yes	01	3.3	15	50	14.4	0.0001
	No	29	96.7	15	50		

Discussion

Mean age, distribution of males and females and distribution of patients with ASA grades was similar in the two groups. Thus both the groups were comparable to each other.

The types of surgeries performed for the two groups were similar and comparable. The mean duration of surgery was significantly more in the dexmedetomidine group than that of fentanyl group.

The height of sensory level was significantly different between the two groups.

Both the drugs took equal time of three minutes from injection to reach the highest sensory level. But the time required for sensory regression to S1 from highest sensory level was significantly higher for dexmedetomidine group patients compared to fentanyl group patients.

The requirement of analgesics was significantly higher for fentanyl group compared to the dexmedetomidine group.

Side effect like hypotension was significantly not different between the two groups. There was only one case of bradycardia in fentanyl group compared to 15 cases in the dexmedetomidine group and this difference was found to be statistically significant.

Gupta R et al. [5] found that there was longer and steady sensory as well as motor block persisted with use of dexmedetomidine in comparison to fentanyl group. We also observed similar findings. The authors noted that the average time required for sensory regression to S1 was 476 minutes which is higher than that observed in the present study where we observed it as 268 minutes on an average.

The authors concluded that dexmedetomidine has better and prolonged sensory and motor block, gave a better stability in terms of hemodynamics and there was reduced requirement for analgesics in comparison to fentanyl. We also found similar findings.

Mahendru V et al. [6] found that patients from dexmedetomidine compared to other groups of patients receiving clonidine, fentanyl and bupivacaine alone showed that the motor and sensory block time was more and this difference was statistically significant. Regression time for two segment sensory blocks was 147 min in dexmedetomidine group while it was 117 min in clonidine group patients, 119 min in fentanyl group patients and 102 min in bupivacaine group patients. These differences were found to be statistically significant. Motor block regression time for going up to zero score of Bromage was 275 min in patients with dexmedetomidine group, 199 min in patients with clonidine group, 196 min in patients with dexmedetomidine group, 199 min in patients with fentanyl group, and 161 min in patients with dexmedetomidine group, 199 min in patients with bupivacaine alone group. These differences were also found to be statistically significant. Patients kept in dexmedetomidine did not demand for rescue analgesics but this demand was more from patients belonging to clonidine, fentanyl and bupivacaine groups.

The author concluded that intra-thecal dexmedetomidine gives very good results in terms of prolonged motor and sensory block time, also provides stability in terms of hemodynamics, and there is less requirement for rescue analgesics. We also observed similar findings.

Singh R et al. [7] studied 100 patients by dividing them into four groups of 25 each. One group was given intrathecal bupivacaine with normal saline (BS), second group was given bupivacaine with clonidine BC), third group was given bupivacaine with clonidine and fentanyl both (BCF) and the fourth group received bupivacaine with fentanyl.

Based on their observations the author concluded that there is prolongation of motor block as well as sensory block, the duration of analgesia after surgery increased and there were few side effects when clonidine was added in 75 μg and 37.5 μg to bupivacaine fentanyl and low dose bupivacaine.

Safari F et al. [8] carried out study among 84 patients and divided them randomly into three equal groups. They found that sensory block onset was lower as compared to patients belonging to fentanyl group and this difference was statistically significant. The patients in the dexmedetomidine group had experienced sensory block for a long time compared to fentanyl group and this difference was statistically significant. The patients in the dexmedetomidine group had experienced motor block for a long time compared to fentanyl group and this difference was statistically significant.

The author concluded that dexmedetomidine is superior to fentanyl. We also noted similar findings.

Khan AL et al. [9] observed that patients from group who received dexmedetomidine compared to patients from fentanyl group achieved highest sensitivity level of T6, T8.

The author concluded that using dexmedetomidine is beneficial to the patients in terms of motor and sensory block achievements, as well as prolonging effect of analgesics after surgery. We also reported similar findings.

Kishore H et al. [10] studied 50 patients having ASA grade I and II who underwent surgeries for lower abdomen. They compared the two drugs i.e. fentanyl and dexmedetomidine. They found that sensory and motor block duration was more in patients who received dexmedetomidine compared to the patients who received fentanyl. This difference was found to be statistically significant. Mean motor block regression time for reaching Bromage zero was noted to be more in dexmedetomidine group compared to the fentanyl group. Patients who received dexmedetomidine experienced analgesia up to 239 min on an average compared to 189 min on an average among patients who received fentanyl. This difference was also found to be statistically significant. The heart rate was also more stabilized in patients who received dexmedetomidine compared to patients who received fentanyl.

The authors thus concluded that dexmedetomidine is superior to fentanyl. We also observed similar findings.

Conclusion

Thus we conclude that intrathecal dexmedetomidine provided longer duration of analgesia as compared to fentanyl. There was significantly lesser requirement of analgesics for patients from dexmedetomidine group compared to patients from fentanyl group. Thus we recommend use of dexmedetomidine in all patients undergoing lower abdominal surgeries.

Key messages

We recommend use of dexmedetomidine over fentanyl in patients undergoing lower abdominal surgeries.

References

1. Boussofara M, Carlès M, Raucoules-Aimé M, Sellam MR, Horn JL. Effects of intrathecal midazolam on postoperative analgesia when added to a bupivacaine-clonidine mixture. Reg Anesth Pain Med. 2006 Nov-Dec;31(6):501-5.
2. Alahuhta S, Kangas-Saarela T, Hollmén AI, Edström HH. Visceral pain during caesarean section under spinal and epidural anaesthesia with bupivacaine. Acta Anaesthesiol Scand. 1990 Feb;34(2):95-8.
3. Hunt CO, Naulty JS, Bader AM, Hauch MA, Vartikar JV, Datta S et al. Perioperative analgesia with subarachnoid fentanyl-bupivacaine for cesarean delivery. Anesthesiology. 1989 Oct;71(4):535-40.
4. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alameddine MM, Al-Yaman R et al. Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta Anaesthesiol Scand. 2006 Feb;50(2):222-7.
5. Gupta R, Verma R, Bogra J, Kohli M, Raman R, Kushwaha JK. A Comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to Bupivacaine. J Anesthesiol Clin Pharmacol 2011;27(3):339-43.
6. Mahendru V, Tewari A, Katyal S, Grewal A, Singh MR, Katyal R. A comparison of intrathecal dexmedetomidine, clonidine, and fentanyl as adjuvants to hyperbaric bupivacaine for lower limb surgery: A double blind controlled study. J Anesthesiol Clin Pharmacol 2013;29(4):496-502.
7. Singh R, Kundra S, Gupta S, Grewal A, Tewari A. Effect of clonidine and/or fentanyl in combination with intrathecal bupivacaine for lower limb surgery. J Anesthesiol Clin Pharmacol 2015;31(4):485-90.
8. Safari F, Aminnejad R, Mohajerani SA, Farivar F, Mottaghi K, Safdari H. Intrathecal Dexmedetomidine and Fentanyl as Adjuvant to Bupivacaine on Duration of Spinal Block in Addicted Patients. Anesth Pain Med 2016;6(1):e26714.
9. Khan AL, Singh RB, Tripathi RK, Choubey S. A comparative study between intrathecal dexmedetomidine and fentanyl as adjuvant to intrathecal bupivacaine in lower abdominal

surgeries: A randomized trial. Anesth Essays Res 2015;9(2):139-48.

10. Kishore H, Raphael P, Simon BP, Vellapally T. A comparative study of intrathecal dexmedetomidine and fentanyl as adjuvants to bupivacaine for lower abdominal surgeries. J Evidence Based Med Health care 2015;2(2):123-30.

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