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Original Research Article

Comparison Study between Heavy Spinal Bupivacaine 0.5% with Heavy Bupivacaine 0.5% and Dexamethasone 8 mg in Spinal anesthesia for Patients Undergoing Total Hip Replacement under Spinal Anesthesia

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Abstract: ***Objective:*** using plain bupivacaine with dexamethasone in spinal anesthesia is a new technique in total hip replacement operation. It provide good sensory and motor block with less complication. Dexamethasone is a potent corticosteroid drug was mixed with bupivacaine. This study was done to compare the incidence of side effects of spinal anesthesia, the duration of both sensory and motor block following administration of heavy bupivacaine alone with administration of plain bupivacaine mixed with dexamethasone. ***Materials and Methods***: 100 patients whose ages between 40 &90 years and weight between 70 &110 KG and American society of anesthesia (ASA) 2/3/4 who underwent total hip replacement under spinal anesthesia were randomly allocated into 2 groups by sealed envelope method, each group with 50 patients. First group received 15 mg heavy spinal bupivacaine alone while the second group received 15 mg heavy bupivacaine mixed with dexamethasone. ***Results:*** The duration of both sensory and motor block was longer in dexamethasone group in comparison to control group ($p<0.001$). The incidence of hypotension, breadycardia and shivering was less in dexamethasone group. ***Conclusion:*** Dexamethasone when mixed with plain bupivacaine prolong the duration of sensory and motor block and reduce the incidence of hypotension, Breadycardia and shivering.

Keywords: Dexamethasone, bupivacaine, total hip replacement.

INTRODUCTION

Total hip replacement operation usually done either under general anesthesia, spinal anesthesia, epidural anesthesia or combined spinal epidural anesthesia. Any of these anesthesia has its own and specific complication and side effects. In General anesthesia you may face difficult intubation, aspiration, delayed recovery or admission to RCU to support ventilation. In neuroaxial (spinal, epidural) anesthesia it may cause bradycardia, hypotension, chest pain and angina especially in old age patients. Usually in spinal anesthesia they use bupivacaine which is long acting local anesthetic agent of amide group with duration of action of about 2-3 hours which is not enough to cover the postoperative period for pain relief. So many researches were done all over the world to prolong its effect by mixing it with another agents like midazolam [1], clonidine [2], dexamethasone [3].

Dexamethasone is a potent glucocorticoid steroid with minimal mineralocorticoid effect discovered in 1957 and first used in 1961 .used in many diseases like rheumatic, skin, allergic diseases. Also used in obstructive lung disease, asthma, brain edema and many other diseases. It is 20 time more potent than hydrocortisone. The mechanism of action of dexamethasone as a blocking agents is:

1. It cause local vasoconstriction so it prolong the duration of action of combined local anesthetic agents.
2. It inhibit the ectopic neural discharge and prevent inflammatory mediator release.
3. It potentiate and increase the potassium channels which are inhibitory effect on nociceptive c fibers through glucocorticoid receptors, hence prolong the activity of local anesthetic agents.

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So dexamethasone has different mechanism of action than local anesthetic agents and when combined together they have additive effect [4].

PATIENTS AND METHOD

This randomized controlled double blind study was done in Alkindi teaching hospital, Alsadir hospital and medical city teaching hospital, from April2020 to June 2021 on 100 patient underwent elective total hip replacement. Their age between 40 and 85 year. Their American society of anesthesiologists (ASA) were between 2-4.

All patients divided blindly into two groups using sealed envelope method. Both the patient and the resident doctor were blind about the procedure and the study. The two groups are:

1. First group includes patients who received 3 ml bupivacaine 0.5% heavy with 2 ml normal saline. This group named BS which is the control group.
2. Second group include patients who received 3 ml bupivacaine heavy 0.5% mixed with 2 ml dexamethasone (8 mg). This group named BD which is the study group.

Some patients are excluded from the study, the exclusion criteria include patients who refused to be enrolled in study, patients who has infection at site of lumber area, patients who has coagulopathy diseases, psychological patients, patients with neurological diseases or neurological abnormalities and patients who has history of allergy to local anesthetic drugs.

After explaining the details, the results and possible complication of operation, all patients signed both the surgical consent and the research acceptance format. Then patients admitted to the theater. In the theatre we put two venous cannula and start glucose saline. Full monitoring (PR, SpO2, RR, ECG) was done. In sitting position and under aseptic technique we use spinal needle type spirit size 22 with length of 9 CM. We inject 3 ml heavy bupivacaine 0.5% with 2 ml normal saline in BS group and 3 ml of heavy bupivacaine 0.5% with 2 ml dexamethasone in the BD group. Motor and sensory block were assessed every 10 minutes during the course of surgery and every 30 minutes in the postoperative period. Duration of sensory block is the period of time between the beginning of full sensory block and the complete disappearance of anesthesia effect, while the duration of motor blocks that period of time between the beginning of motor block to a point of recovery of motor function of lower limbs muscles. Heart rate and blood pressure were recorded every 10 minutes.

Sample Size

As with any statistical analysis of any trial study, we regard the confidence level is 95% (0.95) and we consider the confidence interval is +- 10% (0.1), therefor the width of margin of error will be20% (o.2). From the table of Z scores we found 0.95 is represented by 1.96, so Z score is equal to 1.96. In our hospital in in orthopedic theater bout 20% of patients undergoing surgery under spinal anesthesia so p value is equal to 20% so p=0.2the Q value equal 1-p i.e. Q=1-P so Q=1-0.2=0.8, so pq=0.2* o.8=0.16. Now we square the Z value (1,96*1.96=384.16). This value if we multiply it by pq the result will be 61.4656.This mean that at least that 61 patient must be enrolled in this study. We enrolled 100 patients because of possibility that some patients dropped from the study because of exclusion criteria.

Statistical Analysis

After collection of all data about the pulse rate, blood pressure, duration of both sensory and motor block by the resident doctor and the staff, I use statistical package for social sciences (spss version 2019) to obtain the results. All results were presented as mean and standard deviation. I use the independent t-test to compare means of quantitative data and we use paired t test to compare means of qualitative data and other variables between the control group (BS) and the study group (BD). We consider p value of less than 0.05 as a value of statistical significance.

5 RESULTS

The results and are summarized in the following tables:

Table 1: Demographic profile

	Normal Saline Group	Dexamethasone Group	P Value	Significance
Age(years)	65.040+-1.34	68.740+-13.180	0.068	NS
Gender(male: female)	(28:22)	(19:31)	0.73	NS
Weight(Kg)	77.850+-9.402	76.940+-8.931	0.364	NS
ASA(2:3:4)	(20:16:14)	(20:15:20)	0.228	NS

Table 2: Mean, standered deviation, p value and significance of sensory duration, motor duration, blood pressure, complication

	Normal Saline Gp	Dexamethasone Group	P Value	Significance
sensory duration	211.400+-16.538	290.800+-18.608	0.001	HS
motor duration	185.800+-10.119	270.400+-16.408	0.001	HS
Blood pressure	68.700+-6.456	85.440+-6.731	0.001	HS
Complication(no shivering: shivering) HS=high significant	(35:15)	(45:5)	0.001	HS

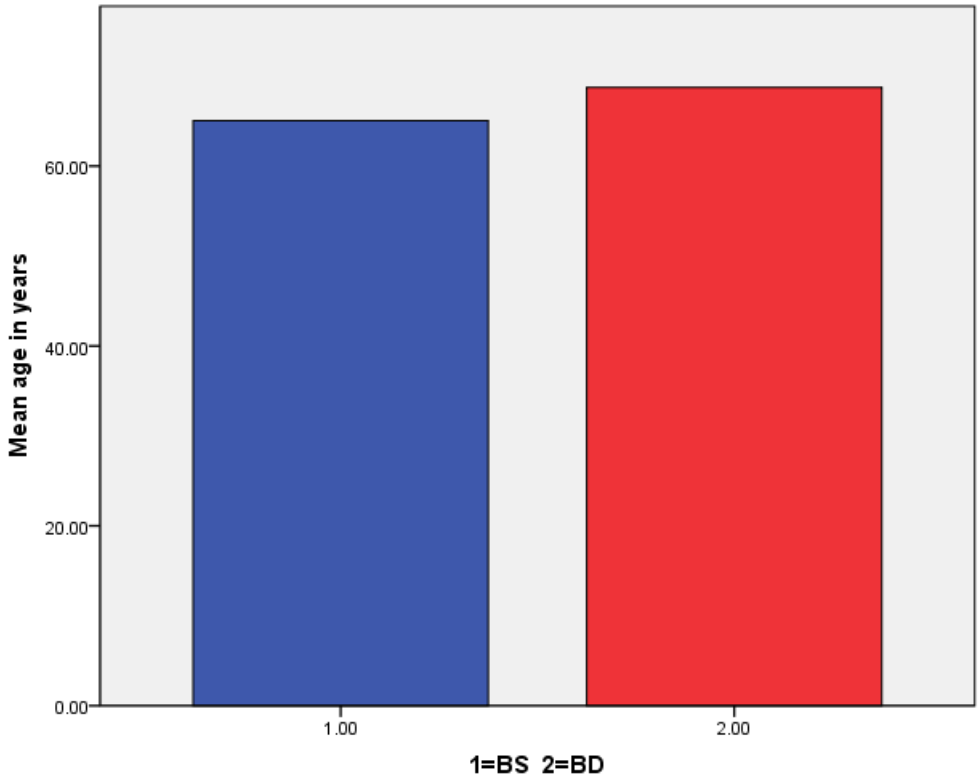

Figure 1: Spinal bupivacaine with normal saline group (BS) versus bupivacaine with dexamethasone group (BD) in the term of age in years, there is no significant statistical difference (p=0.068)

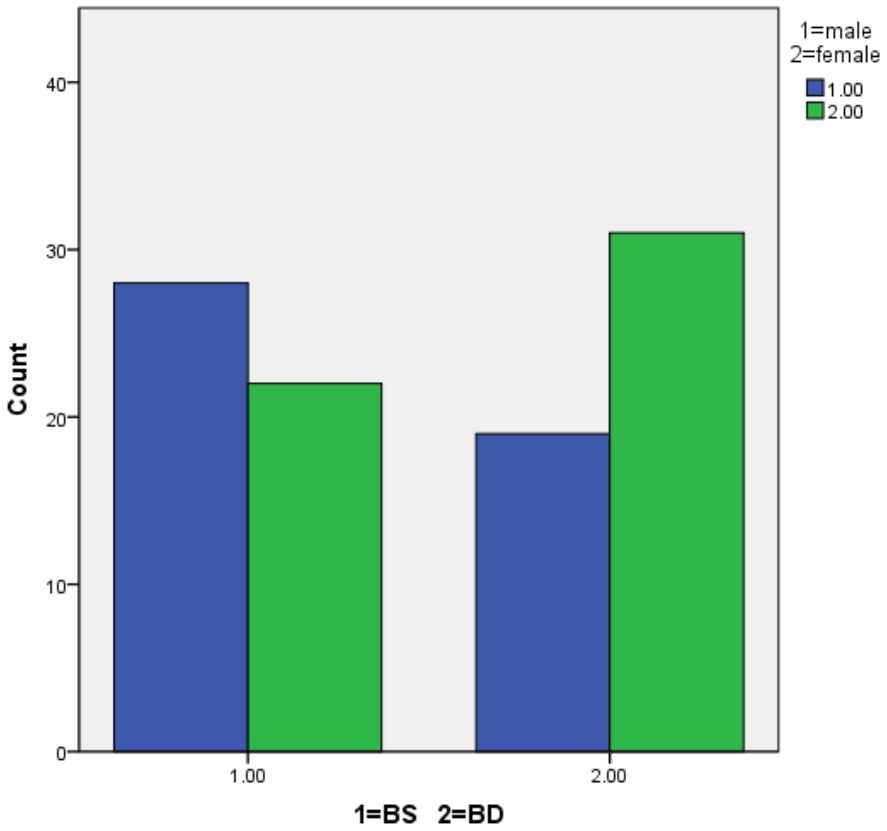

Figure 2: Bupivacaine with normal saline group (BS) versus bupivacaine with dexamethasone group (BD) in the term of gender, there is no significant statistical difference (p=0.73)

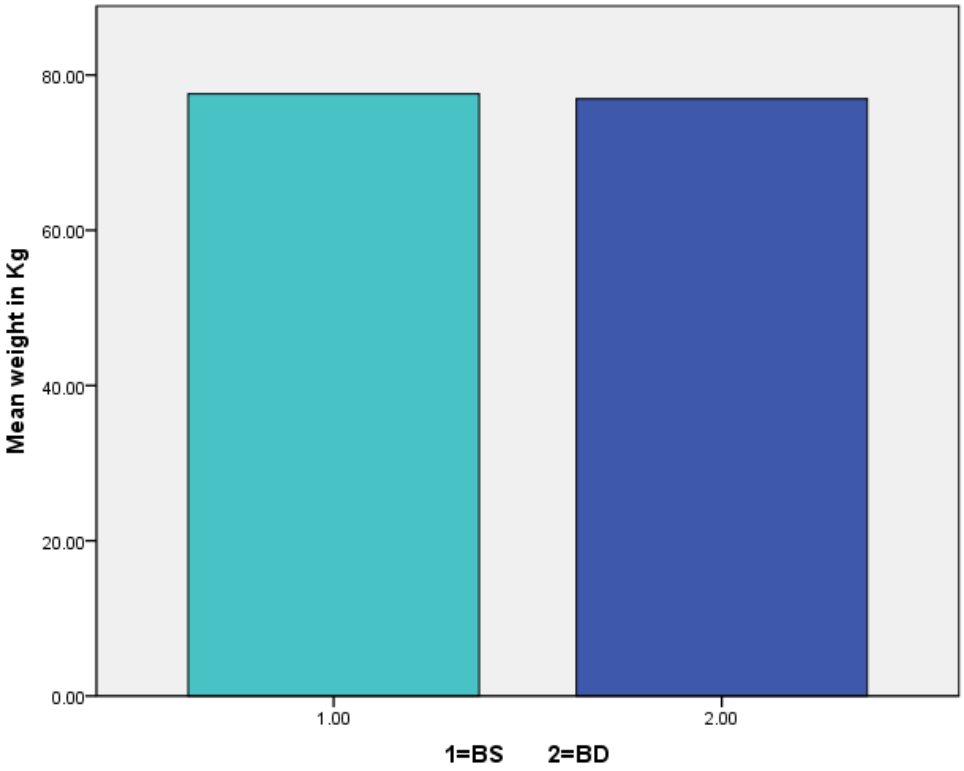

Figure 3: Bupivacaine with normal saline group (BS) versus bupivacain with dexamethasone group (BD) in term of weight in kilogram, there is no significant statistical diffrence(p=0.364)

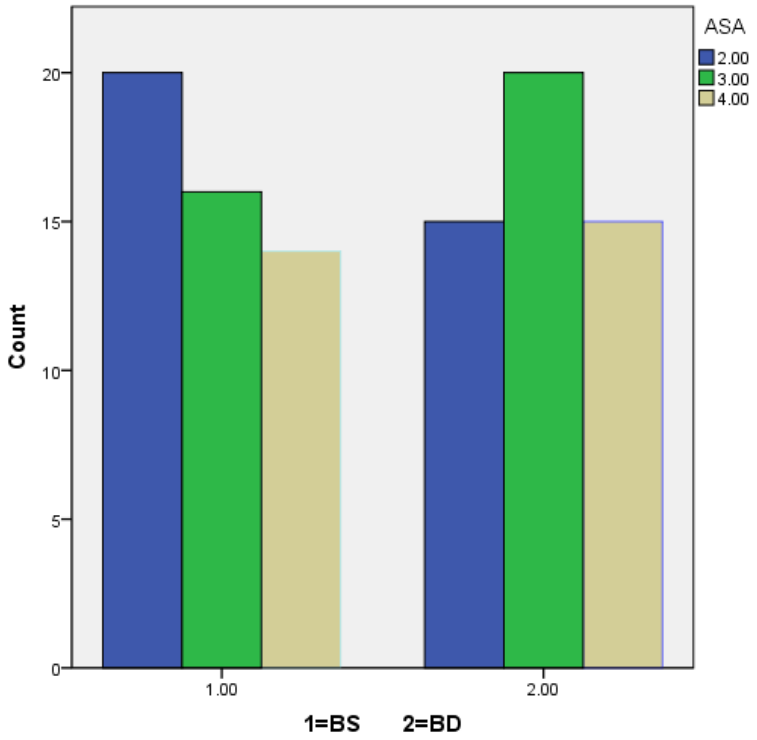

Figure 4: Bupivacain with normal saline group (BS) versus bupivacain with dexamethasone group (BD) in the term of ASA, there is no significant statistical diffrence (p=0.228)

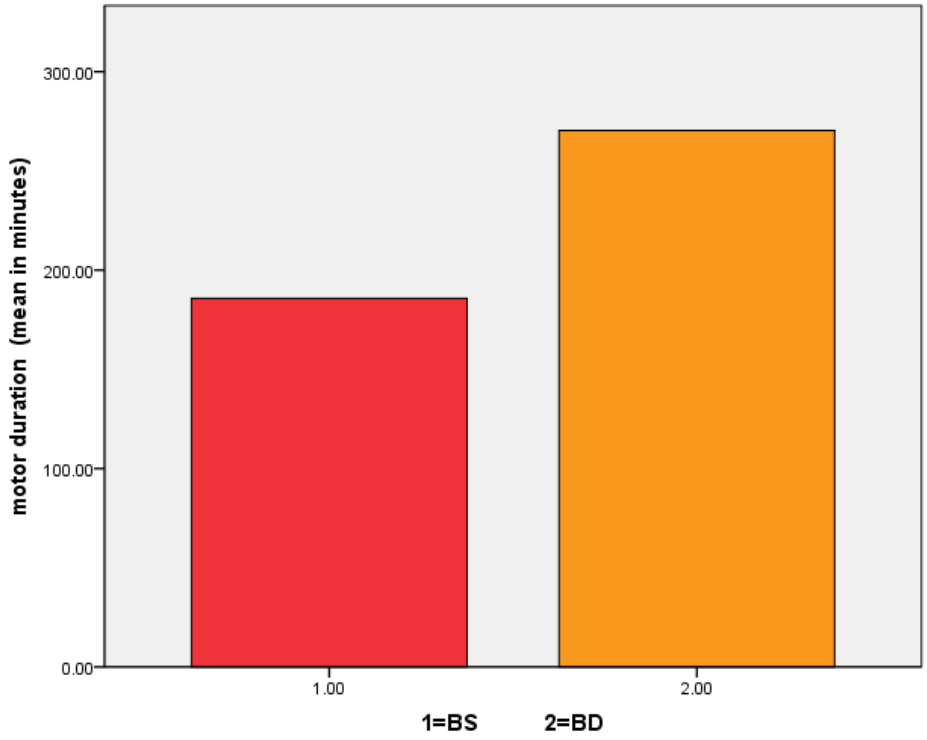

Figure 5: Bupivacaine with normal saline group (BS) versus bupivacaine with dexamethesone group (BD) in the terms of motor duration in minutes,there is significant statistical diffrence (p=0.001)

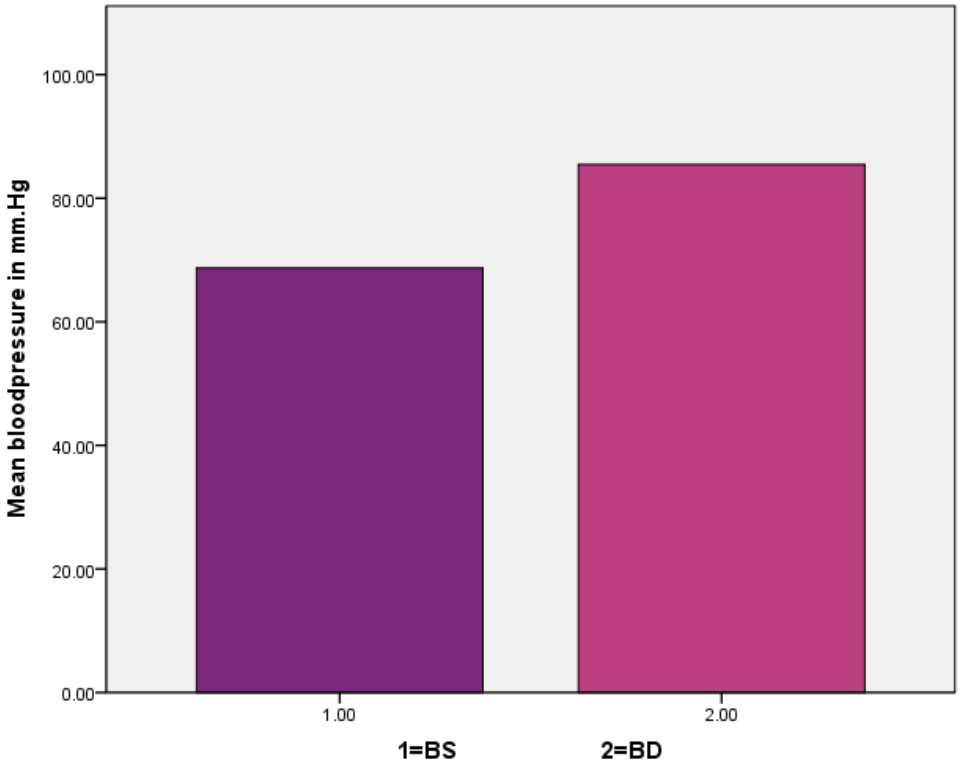

Table 6: Bupivacaine with noral saline group (BS) versus bupivacaine with dexamethasone group (BD) in the terms of mean blood pressure in mm,Hg, there is significant statistical diffrence(p=0.001)

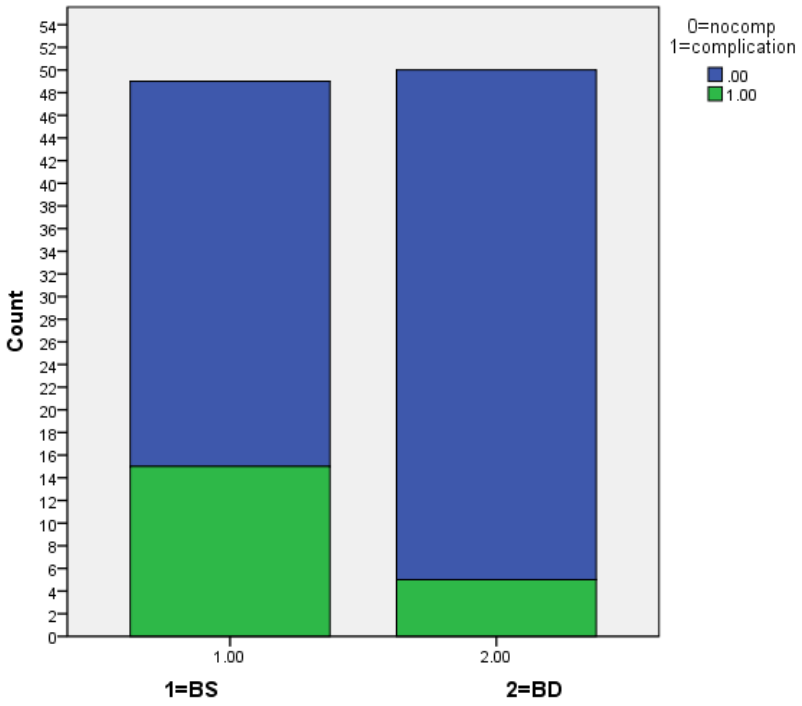

Figure 7: Bupivacaine with normal saline group (BS) versus bupivacaine with dexamethasone group (BD) in the terms of complication (shivering), there is significant statistical difference (p=0.001)

DISCUSSION

As we mentioned in our trial that dexamethasone when it was mixed with heavy bupivacaine 0.5% it prevent hypotension which occurred in spinal anesthesia with bupivacaine alone and it prolong the duration of sensory and motor block. This finding is similar to finding of Tarik M. Ashor and his colleagues who did their double blind study on 110 patient underwent orthopedic surgery of lower limbs with 3 ml of heavy bupivacaine for spinal anesthesia when they gave dexamethasone 8 mg intravenously 2 hours preoperatively, they found that dexamethasone decrease or blunt hypotension after spinal anesthesia [5].

Our results are similar to results of Takachenco R. and his colleagues who did their study on 124 patients underwent elective caesarian section, they divided patients into 3 groups, all groups received 2 ml heavy bupivacaine 0.5% in spinal anesthesia and divided the patients into 3 groups: group B who received one ml normal saline intrathecally, group BD(42 patient) who received 4 mg dexamethasone intrathecally and group D who received dexamethasone 8 mg intravenously. They found that dexamethasone reduce the hypotensive effect of spinal anesthesia when given intrathecally related to group B(Pearson's X1=0.486, x2=0.797, p<0.05) and reduce shivering (X2=0.316, p <0.05), but does not affect vomiting and bradycardia.They also found that intravenous dexamethasone in group D does not reduce the hypotensive, bradycardia and shivering effects of spinal anesthesia [6].

Our results are nearly similar to results of study done by Mahmoud Ali El-Shourbagy and his colleagues who did their trial on 100 patients planned for cesarean section under spinal anesthesia, when they divided patient into 2 groups, first group (A) include 50 patient who received bupivacaine and placebo while second group received dexamethasone added to intrathecal bupivacaine. They concluded that addition of dexamethasone to bupivacaine in spinal anesthesia prolong the sensory block from 91.8+-10.8) minutes in the control group to (122+-7.9) minutes in the study group and p<0.001. Also they found that dexamethasone prolong the postoperative analgesic period till the VAS >6 and the patient need analgesic drug from 215.3+-40.3) minutes in the control group to (434.3+-43.8) minutes in the study group(p<0.01). Thea also found that spinal dexamethasone increase the duration of motor block (p<0.01). They also found that dexamethasone do not affect the onset of sensory block and it is without complication [7].

Mohamed Abdul Muhsen Abdul Naeim Ismaeil and his colleague who carried comparative study between dexmedetomidine and dexamethasone when used intrathecally in spinal anesthesia for 60 patients who undergo cesarian section. They divided the patients into 2 groups, group A who received 5Mg dexmedetomidine plus 12 mg heavy bupivacaine 0.5% and group B who received dexamethasone 8 mg mixed with bupivacaine 2 mg heavy bupivacaine0.5% intrathecally. They found both drugs decrease the incidence and the intensity of shivering and there is no significant statistical difference between

them(p=o,119). They also found that both dexamethasone and dexemedetomidine increase the sensory block duration but dexamethasone increase the duration of sensory block(161.83+-7.00) more than than dexemedetomidine(124.50+-6.72) with p<0.001.They also found that both drugs increase the postoperative analgesia period and the time to first need of analgesic drug, but dexamethasone(196.69+-5.4)increase this postoperative analgesia more than dexemedetomidine(174.26+-12.10) with p<0.001. They also found that dexmedetomidine is more effective in sedating patients in both intra and postoperative period with p<0.01 [8].

The results of our study is nearly similar to results of Nadia bani Hashem and her colleagues who carried double blind study on 50 patient undergoing orthopedics surgery under spinal anesthesia, they divided the patients into two groups, control group who received 15 mg of heavy bupivacaine 0.5% and 2 ml normal saline and study group who received 15 mg of heavy bupivacaine 0.5% and 2 ml 8 mg of dexamethasone. They found that dexamethasone increase the duration of sensory block from 89.44+-8.37)minutes in the control group to (119+-10.69)minutes in the study group with p<0.001. Also they found that analgesia period was prolonged from (202+-430.67) in the control group to (401.92+-72,44) minutes in the dexamethasone group with p<0.001.They found that there is no differences between onset of sensory block, demographic changes and incidence of complication between the two groups [9].

CONCLUSION

Mixing dexamethasone 8 mg to heavy bupivacaine 15 mg in patients undergoing total hip replacement is associated with prolonged duration of both sensory and motor block with less incidence of bradycardia, hypotension and shivering.

Recommendation: In any patient scheduled for total hip replacement, I ask all my colleagues to do it under spinal anesthesia using bupivacaine mixed with dexamethasone. Also I asked all my colleagues to do more researches regarding this subject using bigger sample size in multicenteric trial and applying it in other types of surgery.

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