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EPIDURAL ANAESTHESIA;

SINGLE-SHOT FOR DAY-CASE KNEE ARTHROSCOPY USING A 50-50 MIXTURE OF LIGNOCAINE AND BUPIVACAINE.

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ABSTRACT... Objectives: To compare the benefits and adverse effects of three different drug combinations when used for single-shot epidural anaesthesia for day-case arthroscopy. **Design of Study:** Prospective, random, double-blind study. **Setting:** A 250 bedded secondary care hospital. **Period:** From October 2005 to Feb 2007. **Material and Methods:** We studied 75 adult male patients, aged between 23 to 63 years, weight <100 kg, ASA physical status I or II undergoing elective knee arthroscopy as day-case procedure. Patients were randomly divided into three groups (25 patients in each group) and single-shot epidural anaesthesia was performed using a total of 20 ml epidural lignocaine 2% (Group 1) bupivacaine 0.5% (Group 2) or a mixture containing lignocaine 2% and bupivacaine 0.5%, 10 ml each (Group 3). **Results:** Time to achieve maximum height (in minutes) was similar in group-1 and group-3 (10±4 and 11±2), but it was significantly longer in group-2 (20±3). Block time was comparable in group-2 and 3 (130±25 and 118±37) but it was significantly shorter in group-1 (60±20). Post-operative discharge time was longest in the group-2, and comparable in group-1 and 3.The incidence of complications like bradycardia, hypotension, nausea and vomiting were more in group-2 and less in group-1 and group-3. Inadequate anaesthesia was more in group-1 and least in other two groups. Four patients of group-1 needed rescue analgesia and two from same group needed general anaesthesia as compared to none in group-2 and group-3. In 4-point patient satisfaction scale, maximum patients from Group-3 rated it perfect while most patients from group-1 were not satisfied with the quality of anaesthesia. **Conclusions:** The results of our study show that a 50-50 mixture of lignocaine and bupivacaine with fentanyl 50 µg when used for single-shot epidural anaesthesia for day case knee arthroscopy, provides better quality of analgesia, with fewer incidences of side effects and more patient satisfaction as compared to lignocaine or bupivacaine alone.

Key words: Epidural anaesthesia, local anaesthetics, lignocaine, bupivacaine, day case surgery, epidural fentanyl.

INTRODUCTION

Epidural anaesthesia for day-case procedures is now a well known entity and it offers certain benefits over spinal and general anaesthesia[1-3]. A variety of local anaesthetic drugs are available for epidural anaesthesia.

Lignocaine and bupivacaine are the two commonly used drugs for this purpose and recently expensive local anaesthetics ropivacaine and levobupivacaine have been introduced for clinical use. Each drug offers some advantages but also have its shortcomings.

Lignocaine acts faster, is less cardiotoxic but has short duration of action[4]. Bupivacaine's onset of action is slow and duration of action is longer but it is more cardiotoxic[5].

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In this double-blind randomized study, we tried to find out a drug which can offer us maximum benefits (faster onset, good quality of analgesia, reasonably long duration, easy availability and cost-effective) and fewer side effects (hypotension, arrhythmias and cardiotoxicity) when single shot epidural anaesthesia for day-case arthroscopy are used. The prospective study described in this paper was therefore designed to determine if we combine a 50-50 mixture of these two commonly used drugs (lignocaine and bupivacaine) will it offer any advantage over individual drugs. We studied the onset of action, duration and quality of analgesia, the incidence of side effects and patient satisfaction with different drugs used for single shot epidural anaesthesia. We added fentanyl to all the three different local anaesthetic solutions.

METHODS AND MATERIALS

The study was performed at PAF Hospital Islamabad Pakistan from Oct 2005 to Feb 2007. After institutional review board approval and written informed consent, we studied 75 adult male patients, aged between 23 to 63 years, weight <100 kg, ASA physical status I or II undergoing elective knee arthroscopy as day-case procedure. We evaluated all the patients in the pre-anaesthesia clinic. Patients with a history of hypertension, ischemic heart disease, diabetes mellitus, major back problems, allergy, infection, coagulation abnormality, or neurological disease were excluded.

All patients fasted for 8hours and received no intravascular volume loading before entering operating room, where an IV infusion of Ringer's lactate solution was started as a bolus of 500 ml in 15 min and then at a rate of 10 ml kg^{-1} h^{-1}. Patient's baseline heart rate and blood pressure were recorded. For initiation of epidural anaesthesia we placed the patients in sitting position. Using strict aseptic conditions, skin, subcutaneous tissue, and supraspinous ligament were anaesthetized with 4-5 ml of lignocaine1%. Tuohy needle 18-guage with the bevel directed cephaloid via the midline approach in the L2–L4 vertebral interspace was used and epidural space was identified by using loss of resistance technique using saline. We used a test dose of 3 ml of solution and then injected rest of the drug in 5 ml of increments. To facilitate blinding, the study drugs were prepared by an anaesthetist not involved with subsequent patient assessments. All patients were randomly divided into three groups (each comprising of 25 patients each) using a random number table to receive a total of 18 ml epidural lignocaine 2% (Group 1) bupivacaine 0.5% (Group 2) or a mixture containing lignocaine 2% and bupivacaine 0.5%, 9 ml each (Group 3). Patients were then put in supine position with a pillow under the head and oxygen 2 liters min^{-1} was given via nasal cannulae. Patients requesting sedation were given 2 mg midazolam IV. None of patients was given antiemetic prophylaxis. Thigh tourniquets were used on all patients. Five minutes after the injection, the dermatomal level of block of light touch, temperature, and pinprick discrimination was evaluated with the blunt hinged end of a safety pin, an alcohol-soaked swab, and the sharp tip of a safety pin, respectively. Anaesthesia was considered effective if an upper sensory level to pinprick of T10 or above was achieved. Motor block was assessed by using a Bromage scale (0 = no motor block—full flexion of feet and knees, 1 = partial motor block—just able to move knees, 2 = almost complete block—able to move feet only, and 3 = complete block—unable to move feet or knees). This test was performed at baseline, then 5, 10, 15, and 20 min after injection and as soon as possible at the end of surgery. The anesthesia preparation time was recorded as the time from ensuring the posture of the vertebral column until the end of procedure and putting the patient in supine position. For assessment of the onset of anaesthesia, the time for sensory block to develop to maximum block height and the time to achieve maximum Bromage score were recorded.

Duration of motor block was assessed by recording the time elapsed from the maximum to the lowest Bromage score. The duration of analgesia provided by the solutions was taken as the time elapsed between epidural injection and the first additional analgesic request. Immediately after surgery, patients were questioned about the quality of their anaesthesia using a four-point scale (1 = perfect, 2 = good (some feelings but no discomfort), 3 = average (some discomfort but rescue analgesia unnecessary), 4 =

poor (major discomfort and rescue analgesia mandatory).

All patients were transferred by stretcher to the recovery room. When vital signs were stable for two ten-minutes apart measurements, patients were transferred to the post-anaesthesia care unit (PACU). PACU discharge time was recorded as the time from admission to PACU until the patient met all discharge criteria. These criteria included mental alertness, stable vital signs, absence of nausea, control of pain, ability to ambulate, and ability to void. Monitoring included the heart rate (HR), noninvasive arterial blood pressure (BP), pulse-oximetry, respiratory rate, temperature and the level of consciousness and was recorded by an independent investigator who was also blinded to the study group.

Nausea and vomiting were treated with metaclopramide 10 mg IV and increasing the infusion rate of fluid. Bradycardia was defined as heart rate <50 BPM and treated with atropine intravenously. Hypotension was treated with 5 mg ephedrine IV if systolic arterial pressure decreased by >25% of the pre-anaesthetic value. After completion of surgery patients were transferred to PACU and monitored there. Patients were encouraged to take oral diet. Postoperative pain was evaluated with a visual analog scale (VAS) from 0 = no pain to 10 = the worst pain imaginable. Severe postoperative pain (VAS >7) was treated with fentanyl IV (1 µg kg^{-1}), moderate pain (VAS 3-7) with oral piroxicam and mild pain (VAS 1-2) with oral mefanemic acid (500 mg tid).Walking, voiding, and home-readiness were measured from the release of the tourniquet. Home-discharge criteria consisted of absence of nausea, vomiting and bleeding, minimal or no pain, and ambulating. Voiding was not required before home-readiness but the time to void was recorded if the patient had not yet left the hospital (for example, if no escort arrived). Postoperative pain, PONV and headache were recorded.

DATA ANALYSIS

SPSS-15 was selected for data processing and analysis. After completing the data entry process, data cleaning was performed. Mean and standard deviation was computed for the numeric variables. Chi-square and Fisher's exact test was applied for qualitative variables and "F" test was applied for quantitative variables. P less than or equal to 0.05 was consider to significant.

RESULTS

In this prospective, random, double-blind study, we studied the onset, quality and duration of analgesia, the incidence of side-effects, medical intervention, patient satisfaction, post-operative complications and patient discharge time in the three study groups. The three groups were comparable in age, weight and ASA status (Table-I).

There was no significant difference in anaesthesia preparation time and mean height of sensory block was also similar in three groups (Table-II).Time to achieve maximum height was similar in group-1 and group-3 (10± 4 and 11± 2), but it was significantly longer in group-2 (20± 3) (Table-III). Surgery time was comparable in three groups and was not statistically significant (Table-IV).Block time was comparable in group-2 and 3 (130± 25 and 118± 37) but it was significantly shorter in group-1 (60± 20) (Table-V). Post-operative discharge time was longest in the group-2, and comparable in group-1 and 3 but the difference is not statistically significant as p-value is 0.057 (Table-II).

The incidence of complications like bradycardia, hypotension, nausea and vomiting were more in group-2 and less in group-1 and group-3 (Table-VI). Inadequate anaesthesia was more in group-1 and least in other two groups. Four patients of group-1 needed rescue analgesia and two from same group needed general anaesthesia as compared to none in group-2 and group-3 (Table-VI). Regarding post-operative complications like headache, nausea, vomiting and pain, there were not many differences in the three study groups (Table-VII). In 4-point patient satisfaction scale, maximum patients from Group-3 rated it perfect while most patients from group-1 were not satisfied with the quality of anaesthesia but the difference in proportions is not statistically significant (p = 0.148) (Table-VIII).

Table-I. Patient demographic data.				
Groups/ parameter	**Group I**	**Group II**	**Group III**	**P-value**
Age (years) Mean±S.D Range	 44.36±10.9 63-23	 46.48±8.9 61-28	 44.00±9.6 59-24	 0.630
Weight (Kg) Mean±S.D Range	 62.48±8.7 79-49	 66.16±8.4 82-50	 60.32±9.4 77-46	 0.068
ASA-Status ASA-I ASA-II	 21 04	 22 03	 21 04	 0.899 0.768

Table-II. Intra-operative events.				
Group/ Parameter	**Group-I Mean± S.D**	**Group-II Mean±S.D**	**Group-III Mean±S.D**	**P-value**
Anaesthesia preparation time(min)	17.20±2.3	16.64±2.8	17.80±2.4	0.271
Time to maximum height(min)	10.44±2.5	19.24±1.7	9.84±3.6	0.000
Surgery time(min)	49.72±4.9	50.24±4.3	54.28±1.8	0.000
Block time(min)	61.32±12.4	127.48±16.5	122.04±30.4	0.000
Post-op discharge time(min)	179.00±31.9	171.76±18.5	189.20±24.03	0.057

Table-III. Pair wise Comparisons of Groups with respect to time to maximum height of sensory block.					
(I) Group	**(J)Group**	**Mean Difference (I-J)**	**Std. Error**	**P-value**	**95% Confidence Interval for Difference**
					Lower Bound / **Upper Bound**
Group-I	Group-II	-8.800(*)	.766	.000	-10.327 / -7.237
	Group-III	.600	.766	.436	-.927 / 2.127
Group-II	Group-I	8.800(*)	.766	.000	7.273 / 10.327
	Group-III	9.400(*)	.766	.000	7.873 / 10.927
Group-III	Group-I	-.600	.766	.436	-2.127 / .927
	Group-II	-9.400(*)	.766	.000	-10.927 / -7.873

**The mean difference is significant at the .05 level.*

Table-IV. Pair wise Comparisons of Groups with respect to surgery time.						
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Group-I	Group-II	-.520	1.107	0.640	-2.726	1.686
	Group-III	-4.560(*)	1.107	0.000	-6.766	-2.354
Group-II	Group-I	.520	1.107	0.640	-1.686	2.726
	Group-III	-4.040(*)	1.107	0.000	-6.246	-1.834
Group-III	Group-I	4.560(*)	1.107	0.000	2.354	6.766
	Group-II	4.040(*)	1.107	0.000	1.834	6.246
*The mean difference is significant at the 0.05 level.						

Table-V. Pair wise Comparisons of Groups with respect to block time.						
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Group-I	Group-II	-66.160(*)	5.998	0.000	-78.116	-54.204
	Group-III	-60.720(*)	5.998	0.000	-72.676	-48.764
Group-II	Group-I	66.160(*)	5.998	0.000	54.204	78.116
	Group-III	5.440	5.998	0.367	-6.516	17.396
Group-III	Group-I	60.720(*)	5.998	0.000	48.764	72.676
	Group-II	-5.440	5.998	0.367	-17.396	6.516
*The mean difference is significant at the 0.05 level.						

Table-VI. Intra-operative complications and interventions.			
	Grp-I	Grp-II	Grp-III
Bradycardia	3	7	3
Hypotension	1	5	2
Nausea	2	5	2
Nausea and/or vomiting	0	1	0
Inadequate anaesthesia	6	1	1
Rescue analgesia needed	4	0	0
Need for general anaesthesia	2	0	0

Table-VII. Post-operative complications.			
	Group-I	Group-II	Group-III
PONV*	1	2	1
Pain	4	2	3
Headache	0	1	0
*PONV: Post-operative nausea and / or vomiting			

4-point patient satisfaction scale	Group-I N(%)	Group-II N(%)	Group-III N(%)	P-value
Perfect	15 (60%)	19 (76%)	21 (84%)	0.148
Good	2 (8%)	2 (8%)	1 (4%)	0.807
Average	3 (12%)	2 (8%)	2 (8%)	0.854
Poor	5 (20%)	2 (8%)	1 (4%)	0.162

DISCUSSION

Knee arthroscopy is being increasingly performed as day case surgery. Patients are usually young to middle aged males. There is a wide variety of anaesthesia choices; general, spinal, nerve blocks and epidural[6]. The ideal anesthetic for outpatient knee arthroscopy would be a technique that is easily performed, has a fast onset, and provides good surgical operating conditions with a rapid recovery and minimal side effects[7].

The available options are: general anesthesia with short-acting IV agents or inhaled anesthetics, peripheral nerve blocks, and central neuraxial anesthesia[8]. Clear headed recoveries without any hang over and absence of nausea and/or vomiting is the main concerns after general anaesthesia along with other potential problems e.g. airway problems, post-operative sore throat. Peripheral nerve blocks provide satisfactory anaesthesia but they are usually less familiar to practitioner, take longer time to perform and may have a slow onset of analgesia[9-11]. Many anesthesiologists prefer spinal anesthesia because of its simplicity to perform, rapid and reliable onset and dense analgesia but headache, urinary retention and transient neurologic symptoms are undesirable side-effects which make it a not so popular technique among most of anesthesiologists for day-case knee arthroscopy [12].

Single-shot epidural anaesthesia offers certain benefits over general and spinal techniques. In contrast to spinal anaesthesia epidural anaesthesia overcomes the problems of headache and urinary retention. The main concerns with epidural anaesthesia are: relatively difficult technique, delayed onset of analgesia and failure of block. There is a variety of choices present for drugs used for this technique. Cinchocaine is an ester local anaesthetic which offers advantages of early onset, dense analgesia and short duration of action, but not yet available in our part of world. Lignocaine and bupivacaine are easily available and cost-effective drugs[13-15]. These drugs have been traditionally used for epidural anaesthesia but we studied them by making a 50-50 mixture and found it a better option than individual drug. We added fentanyl to all the three different local anaesthetic solutions because it not only increases the quality and duration of analgesia[16], but it has also bupivacaine sparing effect[17]. Patient turnover time is important in our setup because of tremendous patient load. We have no separate regional anaesthesia room and neuraxial blocks have to be performed in operating room.

CONCLUSIONS

From the results of our study show that a 50-50 mixture of lignocaine and bupivacaine when used for single-shot epidural anaesthesia for outpatient knee arthroscopy, offers certain benefits. Onset, duration and quality of analgesia are reasonably good, incidence of side effects is much low, patient discharge time is shortened and there is more patient satisfaction.

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