Original Article

Cataract Surgery under Local Anaesthesia - Search for Safer One

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Abstract

Background: *Cataract surgery is usually done under local anaesthesia. But till now there are no absolutely safe local anaesthetics. Current study is done to find out a safer local anaesthetic for cataract surgery.* ***Objective:*** *To evaluate the onset, duration, quality, side effects and safety of bupivacaine and lignocaine in peribulbar block (PBB) for cataract surgery.* ***Materials and method:*** *This was a randomized observational controlled clinical study done in Monno Medical College Hospital, Manikganj, Bangladesh, in the period of October, 2014 to October, 2015. Two hundred cataract patients attending ophthalmology department were allocated to receive either 4 mL 0.5% bupivacaine+4 ml 2% lignocaine or 8 mL of 2% lignocaine for peribulbar block during cataract surgery. Onset, duration, quality of anaesthesia and after effects were used as a clinical parameter for the study.* ***Results:*** *Mean anaesthetic durations of lignocaine and bupivacaine+lignocaine were 75 minutes and 120 minutes respectively. Least complications were observed in subjects with lignocaine.* ***Conclusion:*** *Peribulbar blocks with 2% lignocaine provide better anaesthesia for cataract surgery and success rates are high without any complications. Anaesthetic time of lignocaine alone is enough for cataract surgery.*

Keywords: *Cataract surgery; LA (Local anaesthetics); lignocaine; bupivacaine; peribulbar anaesthesia.*

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Introduction

Cataract surgery is the commonest ophthalmic surgical procedure and a local anaesthetic technique (LA) viz. peribulbar block is usually preferred than previous retrobulbar block for its recorded complications.[1] Most commonly used LA agents are 1:1 mixture of 2% lignocaine and 0.5%-0.75% bupivacaine in cataract surgery anaesthesia especially in small incision cataract surgery (SICS) and in some selected cases of phaco-emulsification.[1] Even in developed countries like USA 75% cataract surgeries are done under local anaesthesia till now a days.[1]

Although skilled surgeons perform phaco-emulsification under topical or surface

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anaesthesia as well, but their number is still limited in our country. Sub-tenon, intra-cameral, and general anaesthesia are less practiced options. Patient's comfort, safety and low complication rates are the essentials of local anaesthesia. The ideal agent for ophthalmic block should be safe, painless to inject and produce a rapid onset of dense motor and sensory block, the duration of which must be sufficient for surgery yet not excessively prolonged. The anaesthetic requirements for ophthalmic surgery are dictated by the nature of the proposed surgery, the surgeon's preference and the patient's wishes.

In our country, most of the eye operations lack monitoring facilities and when any acute complication arises, most of the surgeons are not ready for that situation and supporting anaesthetist is not available at that moment with his logistic equipments. Most of the cataract patients are senile in age and usually have one or more debilitating diseases especially diabetes mellitus, hypertension and ischaemic heart disease and use to take multiple drugs. These groups of patients are vulnerable to develop any sort of acute complication in a stressful situation like surgery.

Cases are reported in our country and even in abroad that cataract patients expired on operation theatre table after giving LA agents or after cataract surgery though required pre-operative investigations were done. At least three tragic incidences happened even in Dhaka city's two eye hospitals in recent past. So for patients' and surgeons' safety precautionary measures for cardiac emergency is vital. Pre-operative cardiac status must be assessed by both cardiologist and anaesthetist and it should be considered by the eye surgeon.

Sudden death on operation table after local anaesthesia without any previous illness may be of cardiac origin - cardiac arrhythmias, cardiac arrest, massive myocardial infarction, etc. Intravascular injections of LA agents may be one possibility. In that case bupivacaine is more cardiotoxic than lignocaine and it is more difficult to treat. The present study is done to find a less cardiotoxic drug for cataract surgery.

Materials and method

Following the Institutional Ethical Committee approval, written informed consent from the patients were obtained. A prospective clinical trial was done on 200 patients (aged 50 -70, ASA grade I-II) who were randomly selected for cataract surgery under peribulbar block. Patients were divided in two groups randomly. Group A received 4 mL of 0.5% bupivacaine +4 mL of 2% lignocaine and group B received 8 mL of 2% lignocaine alone. Each group contained equal number of patients.

All the blocks were performed by the surgeon using a 0.5 inch 27G needle. In the operating room standard monitoring was instituted and supplemental O_2 was administered at 2 L/min by nasal cannula. A 20G IV cannula was inserted and attached to an infusion of normal saline just to keep the channel open. No oral premedication was given.

Mean arterial blood pressure (MAP) and heart rate (HR) were recorded just before PBB injection (as baseline value) and at 1, 3 and 5 minutes after block placement. Onset, duration and pain score using a 10 point scale was carefully observed. During surgery all the patients were monitored with regular measurement of pulse, blood pressure and O_2 saturation.

All the adverse effect(s) were noted and subjects were managed accordingly. Data were expressed as mean and proportion.

Results

In both groups male subjects predominated (58%

age in Group A was 65±4.85 years and in Group B 66±5.45 years respectively and Mean±SD of weight of Group A and Group B were 61±9.84 kg and 60±8.68 kg respectively, apparently showing no difference (Table I).

Table I: Age, sex and weight distribution of study subjects (N=200)

Groups	Age (years) Mean±SD	Weight (kg) Mean±SD	Male (%)	Female (%)
Group A (n=100)	65±4.85	61±9.84	58	42
Group B (n=100)	66±5.45	60±8.68	55	45

Table II shows that onset of satisfactory block was earlier in Group B than Group A (3.5±0.09 minutes vs 5±1.1 minutes); on the other hand duration of block was longer in Group A than Group B (120±3.4 minutes vs 75±2.32 minutes).

Table II: Onset of block and duration of block in study subjects (N=200)

Groups	Onset of block in minutes Mean±SD	Duration of block in minutes Mean±SD
Group A (n=100)	5±1.1	120±3.4
Group B (n=100)	3.5±0.09	75±2.32

Regarding adverse events, total 13 (6.5%) subjects out of 200 developed bradycardia and 6 patients developed hypotension. The adverse events were almost exclusively within Group A (Table III).

Table III: Distribution of adverse events (N=200)

Adverse events	Group A (n=100)	Group B (n=100)
Bradycardia (13; 6.5%)	12 (12%)	1 (1%)
Hypotension (6; 3%)	5 (5%)	1 (1%)

Mean arterial pressure, heart rate were almost similar between the two groups, SpO_2 was above 90% in all cases as patients were conscious and responded to verbal stimulation for breathing.

Discussion

The factors affecting a decision about which local anaesthetic to use when performing a peribulbar block are similar to that of any other regional anaesthetic; onset, quality, complications and duration of action. Any local anaesthetic agent in common clinical use is appropriate for the block; however, for clarity, discussion will be limited to two of the most commonly used agents: lignocaine alone and bupivacaine plus lignocaine. Both are amide local anaesthetics and consequently do not have the same potential for sensitivity as do ester-based agents.

Lignocaine is the most commonly used LA agent because of its potency, rapid onset, moderate duration of action and versatility.[2] Lignocaine has been used in concentrations of 2% and 4%; the most commonly used concentration is 2%. In the present study 8 mL of 2% was used. Lignocaine has the advantage in that it has a faster onset than bupivacaine. It has a mean onset of analgesia and akinesia of about 3 minutes and duration of surgical anaesthesia of approximately 2 hours. Lignocaine will produce reliable surgical anaesthesia for 60 to 90 minutes, with loss of sensation for about 2 to 3 hours.

Bupivacaine is widely used as a local anaesthetic in both 0.5% and 0.75% concentrations, with the 0.75% concentration preferred for its ability to produce reliable akinesia. Its onset is within 5 to 10 minutes, and it has duration of surgical anaesthesia of approximately 6 hours. Acute and fatal side effects of LA involve CVS and CNS.[3]

Many practitioners make a combination of equal amounts of bupivacaine 0.5% or 0.75% and lignocaine 2% or 4% for peribulbar anaesthesia. In the present study 4 mL of 0.5% bupivacaine plus 4 ml of 2% lignocaine was used. The rationale for this varies, but generally it is to provide a more rapid onset than plain bupivacaine and a longer duration of action than lignocaine. The shortened duration of action (compared to plain bupivacaine) has not been found to be a problem clinically. Some of the problems associated with the

occasional patient who has received plain bupivacaine and whose eye is still anesthetized 24-hours later are also avoided.

All LA agents cause dose dependent depression in myocardial contractility and also exhibit vasodilating properties with exception of cocaine, a vaso constrictor. Myocardial depression is proportional to the potency of the LA agents.[4]

The use of bupivacaine has also been associated with a higher risk profile for cardiac toxicity when compared with lignocaine.[4] Bupivacaine is more cardio toxic because it binds more strongly to resting or inactivated sodium channels and bupivacaine dissociates from sodium channels during diastole more slowly than does lignocaine.4 There lies the risk of using bupivacaine as LA agent. It is well established that bupivacaine is more cardio toxic than lignocaine per dose administration to achieve a given effect. When electro-physiological differences between LA agents are compared lignocaine is found to enter the ion channels quickly and to leave quickly. In contrast, recovery from bupivacaine blockade during diastole is relatively prolonged making it far more potent with respect to depressing the maximum upstroke velocity of the cardiac action potential in ventricular cardiac muscle. As a result bupivacaine has been labeled a "Last-in Show out" local anaesthetic. This characteristic likely creates conditions favorable for unidirectional block and reentry. Other mechanisms may contribute to bupivacaine cardio toxicity including depression of AV-nodal conduction, depression of myocardial contractility and indirect effect mediated by the CNS.[5] The use of potent LA drugs like bupivacaine is responsible for serious cardiotoxic accidents with a mortality rate of about 50%.[6]

Most toxic reactions of LA agents involve the CNS. Bupivacaine is related to adverse CNS and cardiovascular effects. More fatal side effects include convulsions, coma and respiratory arrest. Not only does bupivacaine induce CNS toxicity but also arrhythmia and myocardial depressions due to the block of sodium channels in the CVS.[7] Accidental injection into the CSF can occur during the retrobulbar block due to perforation of the meningeal sheaths that surround the optic nerve. Chance of such an accident is almost nil during peribulbar block for cataract surgery due to small size needle (0.5 inch) used. Severity of CNS toxicity is proportional to the potency of the LA agents.

The patient may experience disorientation, amaurosis fugax, aphasia, hemiplegia, unconsciousness, convulsions, and respiratory or cardiac arrest a few minutes after the injection. Direct intravascular injection via the optic nerve sheath or local anaesthesia carried by the ophthalmic and internal carotid artery by retrograde flow to the thalamus and midbrain can also present the same way.

Central spread may also occur on a rare occasion, if an orbital artery is cannulated by the needle tip. Retrograde flow of anaesthetic agent from a branch of the ophthalmic artery through the internal carotid artery, to the midbrain can occur. An immediate seizure would result and cardiovascular instability is possible. The toxic intra-arterial dose has been estimated to be as low as 3.6 mg of bupivacaine, which is approximately 0.75 cc of 0.5% bupivacaine.

The time of onset of symptoms is variable, but major sequelae develop usually in the first 15 minutes after the injection. The onset of central nervous system toxicity is almost instantaneous, if arterial injection has occurred.

Eye blocks with lignocaine provide excellent anaesthesia for cataract surgery and success rates are high. Most uncomplicated cataract surgeries can be done on an average within 10-20 minutes. Bupivacaine is routinely mixed with lignocaine to

increase the time of anaesthesia. Approximate anaesthetic durations of them are 90 minutes and 175 minutes respectively which are much more than the time required to any type of cataract surgery. Before SICS and PE, ECCE were done with stitches. At that time there was rationale for mixing up bupivacaine and lignocaine for cataract surgery. Now a days stitching during cataract surgery is almost obsolete except in few situations. Even in those cases only 2-3 stitches are enough which can be done within another few minutes. So there is no rationality of using bupivacaine to increase anaesthetic time and lignocaine alone is enough for cataract surgery.

As now a days for cataract surgery without stitches 10-20 minutes are enough and lignocaine alone is sufficient (covers 45-90 minutes) for that purpose. In other words, bupivacaine is not needed at all for cataract surgery. And it is wise not to use it to avoid its severe cardio toxic and CNS effects. Present author is performing cataract surgery using lignocaine alone for a long time and facing no problem and has observed no extra benefit at all with using bupivacaine mixed with lignocaine. Based on above data and observation, bupivacaine should be avoided in cataract surgery.

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