Indian Journal of Anesthesia and Analgesia

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Office of Publication: Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II
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E-mail: info@rfppl.co.in, Website: www.rfppl.co.in

Journal Website

http://rfppl.co.in/login.php?id=24

Subscription Information

The Indian Journal of Anesthesia and Analgesia is published three times a year.

Volume 3 (3 issues) will be published in 2016.

pISSN: 2349-8471, eISSN: 2455-6238

For information on subscription rates please contact

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INDIAN JOURNAL OF ANAESTHESIA AND ANALGESIA

September - December 2016
Volume 3 Number 3

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Editorial

Received on 21.09.2016, **Accepted on** 12.10.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016

Neuromuscular Blocking Drugs: Where are We Now?

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Introduction of neuromuscular blocking drugs (commonly though incorrectly called muscle relaxants) has revolutionized the modern anesthetic practice. They are usually used as an adjunct to anesthesia for attaining skeletal muscle paralysis to facilitate tracheal intubation and to optimize the surgical field. Facility and expertise to support respiration and mechanical ventilation should be available before using these drugs. As they do not produce sedation, amnesia or analgesia, general anesthesia with additional analgesia and amnesia are required for preventing awareness during the procedure. In the Intensive Care Unit (ICU), they are used to facilitate mechanical ventilation and minimize patient-ventilator asynchrony. They also reduce the oxygen consumption and help to reduce raised intracranial tension.

Neuromuscular blockers bind to the postsynaptic acetylcholine receptors blocking neuromuscular transmission causing skeletal muscle paralysis. These drugs are classified as depolarizing and nondepolarizing agents, according to their mechanism of action. Depolarizing agents bind to the acetylcholine receptors causing persistent depolarization producing muscle fasciculations followed by flaccid paralysis. Succinylcholine is the only currently used depolarizing agent. Nondepolarizing agents act as competitive antagonists of the nicotinic receptors, blocking the action of acetylcholine causing skeletal muscleparalysis. Commonly used non depolarizing drugs are of two groups, aminosteroids (pancuronium, vecuronium, rocuronium) and benzylisoquinoliniums (atracurium, cisatracurium, doxacurium, mivacurium).

'Curare" was the name used to describe the poisonous extract obtained from woody wines of South America. This has been traditionally used to make poison tipped arrows for hunting animals which die due to respiratory paralysis and suffocation. Natives called this plant "woorari", which became "curare" to the Europeans. In 1825, Sir Benjamin Brody found that curare does not kill the animal, if its respiration is supported artificially. He also suggested that curare could be used for the treatment of tetanus. Waterton in 1859 tried it for treating hydrophobia, but the patient died before the drug was administered. George Harley in 1850 showed that curare was effective in the treatment of tetanus and strychnine poisoning.

It was Claude Bernard in 1857 who demonstrated that the effect of curare is due to the blockade of nerve impulses across the neuromuscular junction. In 1942, Wintersteiner and Dutcher isolated the alkaloid d-tubocurarine from the plant Chondrodendron tomentosum [1]. The first clinical use of curare was probably in 1940 when A.E. Bennett, a psychiatrist, combined metrazol injections with curare to neutralize the strong muscle contractions of convulsive shock therapy [2].

On 23rd January 1942, Harold Griffith, anaesthetist from Montreal used curare for the first time in anaesthesia for a patient undergoing appendicectomy [3]. This was introduced into anaesthetic practice in the 1940s for tracheal intubation and skeletal muscle relaxation for abdominal surgeries. However, its potential for histamine release and hypotension was a major drawback.

Pal in 1899 had shown that physostigmine could reverse the block produced by curare [4]. From the time of initial use of tubocurarine in clinical anaesthesia, anticholinesterase drugs neostigmine and pyridostigmine has been used for restoring the neuromuscular blockade.

In 1947, Daniele Bovet, a Swiss-Italian pharmacologist introduced the first synthetic clinically used neuromuscular blocking drug, gallamine, which was a non depolarising agent, the action of which was reversible with anticholinesterases similar to tubocurarine. It is currently out of use due to its vagolytic action causing

tachycardia and hypertension. It has the potential for histamine release and anaphylactoid reaction has been reported with its use. As gallamine can cross the placenta, it is best avoided in obstetric practice.

Decamethonium was the first synthetic depolarizing neuromuscular blocking agent discovered by Paton in 1949 [5]. It was different from d-tubocurarine in that the duration of action was shorter with fasiculations preceding the block and the action was not reversed with anticholinesterases.

Bovet in 1949 published the work on succinylcholine a synthetic depolarizing agent, with a structure of two acetylcholine molecules for which he was awarded Nobel Prize in 1957. The rapid onset of its action producing flaccid paralysis and short duration of action due to its rapid metabolism by plasma cholinesterase made it attractive for tracheal intubation, especially for rapid sequence induction-intubation (RSI). However, its undesirable effects like cardiac dysrrhythmias including sinus arrest, potential for hyperkalemia and malignant hyperpyrexia, rise in intracranial, intraocular and intragastric pressures and postoperative muscle pain probably due to the muscle fasiculations made it an undesirable choice in many situations. As most of these were due to the result of depolarizing block, search began for a nondepolarizing agent having an onset, quality and duration of action comparable to that of succinylcholine.

In 1964, Hewett and Savage synthesized an aminosteroidal molecule with two quaternary ammonium groups which had curare like effects, and named pancuronium, which replaced the other non depolarising neuromuscular blockers due to its relative safety profile [6]. The vagolytic effect and prolonged action of pancuronium initiated the search for compounds devoid of these unwanted effects.

Savarese and Kitz in 1975 defined ideal non depolarising neuromuscular blocking agent as one with brief, non cumulative, action with rapid onset and recovery which is reversible by antagonist and lackingserious side effects [7].Thus came up the introduction of the aminosteroidal drug vecuronium which almost met the criteria. However, its prolonged action in those with hepatic and renal failure was a serious drawback.

Pipecuronium, an analogue of vecuronium is a very potent bisquaternary aminosteroid neuromuscular blocking agent with a much prolonged duration of action recommended only for lengthy surgical procedures.The duration of action is further prolonged in patients with renal impairment.

In 1973 Stenlake and colleagues synthesized atracurium, a benzylisoquinoline molecule causing non depolarizing block with an intermediate duration of action which was not affected by renal or hepatic failure as it undergoes Hofmann elimination, a nonenzymatic degradation under physiological pH and temperature. But its potency for histamine release and hypotension was a serious drawback [8]. Laudanosine, a metabolite of atracurium, has central nervous system stimulating effects which could result in seizures. However, Cis-atracurium, an isomer of atracurium, wasfound to befour times potent than atracurium and does not release histamine, but 77% of its elimination is organ-dependant, which was a serious disadvantage.

The continued search for better nondepolarizing agents led to the synthesis of benzylisoquinolinedrugs like mivacurium and doxacurium in the early 1980s. Mivacurium is an ester-linked compound metabolized by plasma cholinesterase, having a slower onset than succinylcholine, but had a rapid recovery [9]. Doxacurium had the advantage of a better cardiovascular profile over mivacurium, but became unpopular due to its longer duration of action.

Bowman in 1988 established that with the aminosteroids the speed of onset is related to the potency, with less potent drugs having a faster onset of action [10]. Rocuronium an analogue of vecuronium was found to have an onset comparable to that of succinylcholine emerged as a substitute for it especially for RSI due its lack of the side effects of depolarizing drugs. However, the longer duration of action with kidney and liver dependant elimination turned out to be its disadvantages [11]. Sugammadex, a selective binding agent encapsulates rocuronium making it inactive in the plasma and unable to bind to the acetylcholine receptor at the neuromuscular junction reversing the blockade within minutes [12]. Rocuronium–sugammadex complex is eliminated through kidney. There have been reports of anaphylaxis or anaphylactoid reactions to sugammadex which prevents its routine usage for reversal.

Rapacuronium is another analogue of vecuronium introduced in 1990 with a rapid onset close to that of succinylcholine, but was withdrawn due to instances of severe bronchospasm [13].

All the currently available neuromuscular blocking drugs have their limitations for clinical use. The searchstill continues for an ideal nondepolarizing agent having a rapid onset, easily reversible, non-cumulative action, non organ dependent elimination, free from hemodynamic side-effects having no

pharmacologically active metabolites [14]. However, the rapid onset, quality of relaxation and speedy recovery of the depolarizing agent succinylcholine is unique despite its undesirable effects and its use will continue till the search for an ideal non-depolarizing agent to replace it is succeeded.

Gantacurium is a new experimental non depolarizing neuromuscular blocking drug representing the third generation of tetrahydroisoquinolinium compound [15]. It has a rapid onset and an ultrashort duration of action to challenge the pharmacological profile of the gold-standard ultrashort acting depolarizing agent succinylcholine. It undergoes rapid "chemo-inactivation" by cysteine adduct formation independent of body pH and temperature followed by biodegradation via ester hydrolysis and the by-products eliminated throughkidney and liver.Recovery from gantacuriuminduced neuromuscular blockade can be shortened by administration of l-cysteine [16]. Introduction of this novel non depolarizing neuromuscular blocker into clinical practice would probably replace the depolarizing drug succinylcholine

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Original Article

Received on 09.07.2016, **Accepted on** 22.07.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.1

Comparison of Intravenous Dexmedetomidine Versus Midazolam for Sedation and Post-operative Analgesia with Spinal Anesthesia

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Abstract

Background: Central neuraxial anaesthesia may need to be supplemented with benzodiazapines, alpha$_2$ blockers etc. for sedation and analgesia. In the present study, we compared the effects of intravenous dexmedetomidine and midazolam on sedation, post-operative analgesia, and spinal block duration in lower abdominal surgeries like inguinal hernias and appendicectomies performed under spinal anaesthesia. *Methods:* This prospective randomized controlled double blind study was carried out in 60 patients. Group D (n=30) received IV premedication with Dexmedetomidine 0.5mcg/kg while Group M (n=30) received IV Midazolam 0.05mg/kg fifteen minutes prior to subarachnoid block with bupivacaine 0.5% 3.5ml. Onset and duration of sensory and motor blockade, level of sedation, cardiorespiratory parameters and quality of post-operative analgesia were recorded.

Results: The duration of sensory blockade was significantly prolonged in group D (280.00 ± 31.62 minutes) as compared to group M (263.00 ± 30.30 minutes) ($p<0.05$). The duration of analgesia was significantly prolonged in group D (261.50 ± 90.85minutes) than group M (213.67 ± 49.02minutes). The sedation scores were higher in group D as compared to group M in the beginning but comparable later on. The pulse rate was significantly decreased in group D than in group M. The systolic, diastolic and mean arterial pressures were significantly decreased in group M. There was no significant difference in respiratory rates in both the groups. *Conclusion:* IV premedication with dexmedetomidine 0.5 mcg/kg prolongs the duration of sensory blockade as compared to IV midazolam 0.05 mg/kg. Dexmedetomidine produces sedation with easy arousability, and provides better analgesia than midazolam.

Keywords: Dexmedeto-Midine; Midazolam; Premedication; Sedation; Spinal Anesthesia.

Introduction

In 1898, August Bier first used spinal anaesthesia as an anaesthetic technique for surgery, since then spinal anaesthesia is a preferred method of anaesthesia for surgeries on lower half of the body[1]. This is due to its efficacy, rapidity, minimal side effects on mental status, reduction of blood loss and protection against thrombo-embolic episodes. However, it may be associated with stress and anxiety leading to various manifestations like increasing oxygen consumption, respiratory rate and heart rate due to circulating level of endogenous catecholamines and their untoward effects. Hence, some patients require sedatives to limit discomfort. Also, surgery represents a form of premeditated injury to the body stimulating free nerve endings and specific nociceptors, and leads to post-operative pain. Adequate control of pain in the perioperative period may improve the post-operative outcome and shorten the hospital stay. Thus to make patients under central neuraxial blockade comfortable during surgery and for adequate post-operative analgesia, different supplements may be required.

Midazolam, an ultra-short acting benzodiazepine has amnesic, anxiolytic and sedative properties[2]. However its intravenous use is associated with cardio-respiratory side effects causing oxygen desaturation and occasionally, a cardiopulmonary

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complication.

Dexmedetomidine is a highly selective alpha$_2$-adrenoreceptor agonist with sedative, analgesic and antisialagogue effects [3]. Dexmedetomidine offers hemodynamic stability, diminished sympathetic response to stress, has minimal effects on respiration and has only minor effects on cognitive functions.

To our knowledge, little information is available in literature about the effects of IV dexmedetomidine used in single dose as an adjunct to spinal anaesthesia. In the present study, we hypothesize that intravenous dexmedetomidine is better than midazolam for intraoperative sedation and post-operative analgesia in lower abdominal surgeries under spinal anaesthesia. Also we plan to compare their effects on the onset, duration of sensory and motor blockade, and their cardiorespiratory endpoints.

Materials and Methods

The study protocol was approved by Instituitional Ethics Committee, and written informed consent was obtained from each patient. This study was carried out in 60 adult patients of either sex between 18-60 years of age, classified as American Society of Anesthesiologists' (ASA) physical status I-II, undergoing lower abdominal surgeries: appendicectomy and unilateral inguinal hernia repair, under sub-arachnoid blockade. The patients with body mass index >30kg/m^2, height <145 cm or >160 cm, known contraindication to spinal anaesthesia (eg. coagulation disorders, infection at puncture site, hypovolemia, pre-existing neurological deficits in lower extremities), hemodynamic instability, therapy with pain perception modifying drugs, pregnant and lactating mothers, use of sedative medications within a week prior to surgery, were excluded. Patients were randomly divided into two groups of 30 each, using computerized randomization table in a double blind manner. Patients receiving premedication with IV dexmedetomidine 0.5 mcg/kg were termed as group D while those receiving IV midazolam 0.05 mg/kg were in group M.

After confirming adequate starvation, patients were wheeled in the operating theatre and monitors including cardioscope, pulse-oximeter and non-invasive blood pressure cuff were attached and baseline values were recorded. A 20G IV cannula was secured in upper limb and patients were preloaded with Ringer's lactate 10 ml/kg.

The study drug was pre-mixed with normal saline to a total volume of 10ml and was infused IV over a period of 10 minutes using infusion pump. Five minutes after the end of infusion, subarachnoid block with Inj.Bupivacaine 0.5% (heavy) 3.5 ml, was given in left lateral position with midline approach in L_3-L_4 interspace using 25-G Quincke needle. Oxygen was supplied via face mask with flow rate of 6 L/min, throughout the procedure. Both the patient and the anaesthesiologist administering the drug were blinded to the treatment group, and all recordings were performed by this anaesthesiologist.

The time of onset and duration of sensory block was noted. The highest level of sensory blockade was checked by pinprick method from caudal to cephalad direction every 2 minutes after the subarachnoid block and time taken to achieve this was noted as time of onset. Duration of sensory blockade was defined as the time from injection of subarachnoid drug till the level of regression up to L_5- S_1 level assessed by re-appearance of sensation on heel and sole of foot.

The time of onset of motor blockade was the time taken to achieve the highest level of motor blockade checked by Modified Bromage Scale (0 - full flexion of hip, knee and ankle,1 - unable to raise extended leg, 2 - unable to flex knee, 3 - unable to flex ankle). Duration of motor blockade was defined as the time from injection of subarachnoid drug till return to modified bromage scale 0 [4].

Intra-operative sedation was graded by Ramsay Sedation Score (RSS) (1- anxious and agitated, 2- co-operative and oriented, 3- drowsy but responsive to commands, 4- asleep but with a brisk response to glabellar tap or loud auditory stimuli, 5- asleep but with a sluggish response to tactile stimuli, 6- asleep and no response)[5].

Postoperative pain was assessed by 10cm Visual analogue scale (VAS) (0=no pain, 10=worst possible pain) [6]. Duration of analgesia was considered as interval from time of intrathecal injection to time of first rescue analgesic demanded or when VAS > 4. Inj. diclofenac 75 mg intravenously was used as a rescue analgesic. The total number of analgesic doses in the first 24 hours was noted.

Vital parameters like heart rate (HR), mean arterial blood pressure (MAP), peripheral oxygen saturation (SpO2) and respiratory rate (RR) were noted every 2 minutes for first 10 minutes, every 5 minutes till the end of surgery, every 30 minutes for next 4 hours and thereafter at 2 hours interval for 24 hours. The level of sensory blockade, motor blockade, VAS and RSS score were noted every 15 minutes for first 2 hours, every 30 minutes for next 4 hours and thereafter at 2 hours interval for 24 hours.

Duration of surgery was noted at the end of surgery. No prophylactic pain relief was given. Patients were transferred to post-operative anaesthesia care unit and monitoring was continued for 24 hours. All the patients were observed for following side effects:

Nausea, vomiting, excessive sedation (RSS>5), hypotension (fall in blood pressure > 20% from baseline) treated with intravenous additional 200ml RL and ephedrine 6 mg, respiratory depression (RR < 12 breaths/min), bradycardia (fall in HR < 60/ minute) treated with IV atropine 0.01mg/kg, high spinal level treated with general anaesthesia, resuscitation if required.

Statistical Analysis

Considering the power at 80% and confidence interval at 95%, to detect at least 15% difference in duration of analgesia, the minimum sample size required was 16 patients in each group. However we included 30 patients in each group for better validation of results. Data analysis was done using SPSS software version 15. The data was statistically analysed using unpaired student's 't 'test for continuous variables (age, height, duration of surgery/analgesia, pulse, BP, RR, RSS, VAS etc). Chi square test was used to analyse demographic data for categorical variables (sex, type of surgery, ASA grade) and treatment factors (number of analgesics required in 24 hours, peak sensory level etc). Descriptive statistics are summarized as mean ± standard, whereas categorical variables are expressed in percentages.

The '*p*' value of < 0.05 was considered as statistically significant.

Results

The study was completed in all the patients. The demographic data did not differ between the two groups (Table 1).

RSS ranged from 2-4 in both the groups. RSS in group D were statistically higher between 4 and 10 mins, i.e. immediately after giving SAB in the early period, while that in group M were higher in the later period, $1^1/_2$ to $2^1/_2$hrs and then between 4 to 5 hrs. The maximum mean score of sedation (3.17) was achieved 35 min after starting dexmedetomidine infusion (20 min after SAB), while it took 55 min for midazolam infusion (40 min after SAB) to achieve maximum mean score (3.53) (Figure 1).

The 24-hr VAS scores were similar in both groups. Time of rescue analgesia was later in group D than in group M ($p<0.05$). Analgesic requirement during 24 hours (post-SAB) among both the groups was comparable (Table 2) (Figure 2).

There was no significant difference in the two groups in terms of onset of sensory block, and onset and duration of motor block. However, the duration of sensory block was statistically prolonged in group D than in group M ($p<0.05$).

Table 1: Demographic data

	Group D	Group M	P Value
Age (yr)	31.67±8.75	32.57±9.62	0.706
Weight (kg)	59.33 ± 5.96	60.47 ± 4.45	0.407
Height (cm)	160.2 ± 3.22	159.2 ± 3.04	0.237
Sex (M/F)	23/7	22/8	0.736
ASA (I/II)	26/4	26/4	1.00
Surgery (Appendicectomy/Hernia)	16/14	15/15	
Duration of surgery (min)	73.17 ± 15.23	73.67 ± 15.81	0.901

(Values are expressed as mean ± standard deviation or numbers.)

Table 2: Data regarding onset and duration of sensory and motor block, and postoperative analgesia. (Values are expressed as mean ± standard deviation)

		Group D	Group M	p value
Sensory block (min)	Onset	1.37 ± 0.56	1.47 ± 0.51	0.470
	Duration	280.00 ± 31.62	263.00 ± 30.30	0.038
Motor block (min)	Onset	2.47 ± 0.78	2.60 ± 0.62	0.466
	Duration	217.67 ± 24.02	210.33 ± 23.27	0.235
Time of rescue analgesia (min)		261.50 ± 90.85	213.67 ± 49.02	0.014
Number of analgesics in 24-hr		2.30 ± 0.53	2.47 ± 0.51	0.221

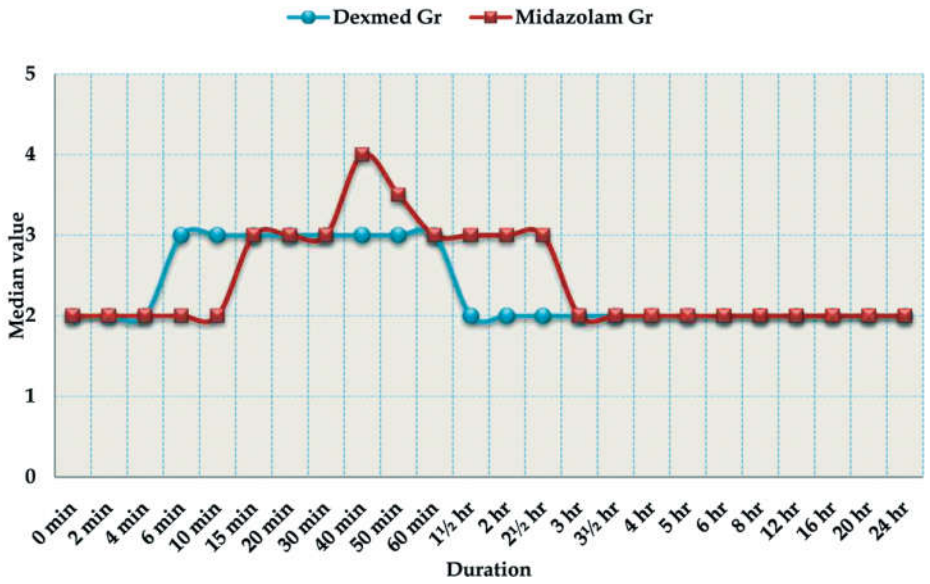

Fig. 1: Comaprison of Sedation score at various interval among study group

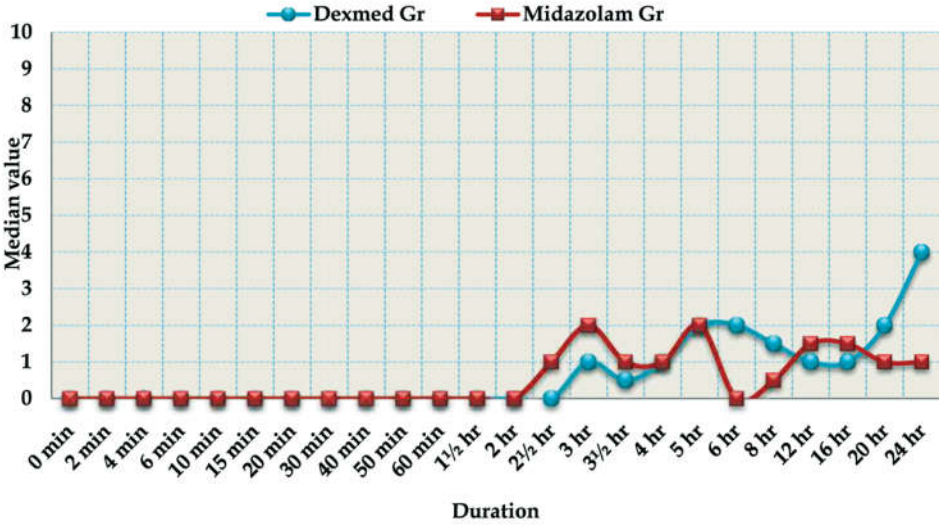

Fig. 2: Comaprison of VAS score at various interval among study group

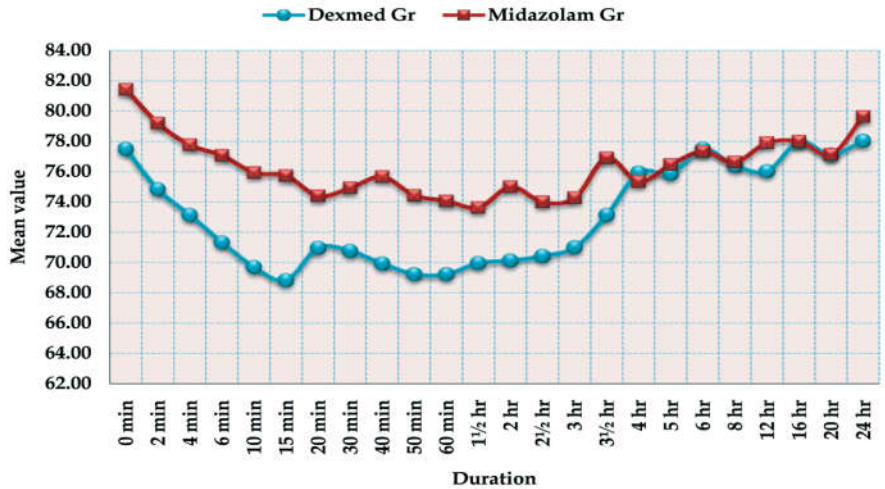

Fig. 3: Comaprison of Pulse Rate at various interval among study group

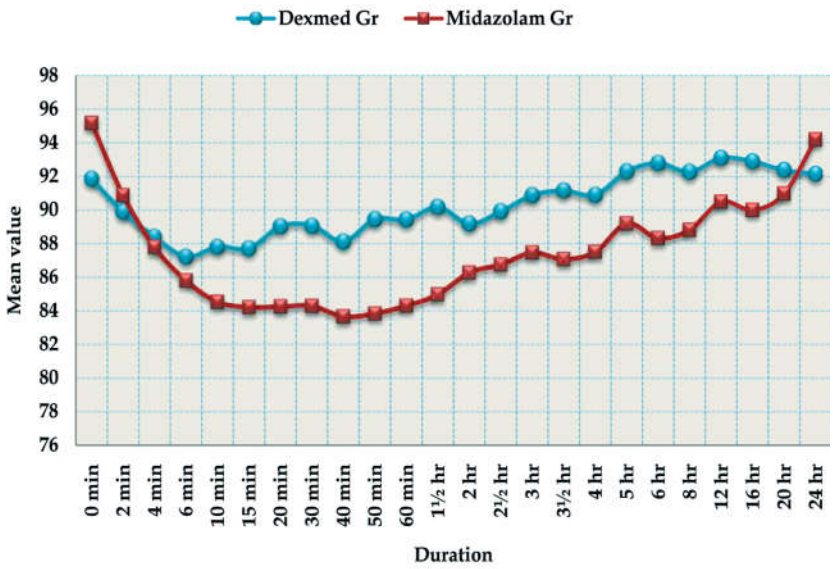

Fig . 4: Comaprison of Mean Arterial Pressure (mmHg) at various interval among study group

There was decline in pulse rate from the baseline in both groups, significant in first 3½ hours (post SAB) in group D ($p < 0.05$) than group M. Nine patients in group D presented with bradycardia (and were treated for the same), while none in group M ($p<0.001$) (Figure 3).

A fall in mean arterial pressure (MAP) from the baseline has been observed in both the groups, significant in group M ($p<0.05$) as compared to group D. But none in either group required treatment for hypotension. The variations in respiratory rates and SpO2 were negligible in both the groups (Figure 4).

No other complications attributable to the drugs and procedure were noted.

Discussion

The aim of intra-operative and post-operative relief of anxiety and pain is to provide comfort and to inhibit trauma induced nociceptive impulses, thereby blunting autonomic and somatic reflex responses to pain. Postoperative analgesia plays a pivotal role in medical practice enabling faster restoration of physiological functions.

Spinal anesthesia is a popular and preferred anesthetic technique for surgeries on abdomen and lower limbs. But some drawbacks are linked with it, eg. fear of needles, pain at puncture site, recall of events, stress, anxiety etc. This emphasizes the importance of sedation that offers anxiolysis, analgesia and amnesia. The ideal sedative agent should have minimal side-effects, particularly a lack of hemodynamic impairment and respiratory depression.

Dexmedetomidine, an alpha-2 receptor agonist has sedative, analgesic, sympatholytic properties with minimal respiratory depression[3]. Its half-life is 2 hours. Midazolam belongs to benzodiazepine group, with elimination half-life of 1-4 hours [2]. It acts on the benzodiazepine binding site of $GABA_A$ receptors by facilitating its action, and thus mediates sedation and anxiolysis.

According to previous studies, supplement of intravenous dexmedetomidine as loading dose followed by infusion, in patients receiving epidural anesthesia and spinal anesthesia provided good sedative effect and postoperative pain management without any clinically important untoward cardiorespiratory reactions [7-9]. The present study demonstrated similar results following use of single dose of dexmedetomidine (0.5 mcg/kg) intravenously as an adjunct to spinal anesthesia.

The present study was conducted in patients undergoing appendicectomy or unilateral inguinal hernia repair as the estimated duration of these surgeries is usually < 1½ hours, which is no longer than the half-lives of any of our study drugs, if used as a single dose. Dexmedetomidine may cause bradycardia, hypotension if rapidly administered, hence recommended to be infused slowly over a period of 10 minutes[10]. In our pilot study infusing different doses of midazolam or dexmedetomidine for induction of sedation, we found that 0.05 mg/kg

of midazolam or 0.5 μg/kg of dexmedetomidine provided sedation with RSS ≥ 3. Thus we chose the initial doses used in the present study.

It was noticed that clinically, the patients in dexmedetomidine group were more comfortable and at the same time easily arousable than the midazolam group while giving subarachnoid block. This arousable sedation is preferred during spinal puncture as patients can inform any paresthesia caused which can be associated with postoperative neurologic deficit. The sedation scores were higher in the early period (4 to 10 min post SAB) in dexmedetomidine group, and in the later period ($1^1/_2$ to 5 hrs) in midazolam group. Since, the half-life of midazolam is longer than dexmedetomidine, the sedation lasted longer in group M than in group D. However, as none of our surgeries lasted longer than 1 ½ hrs, patients in group D were equally comfortable as those in group M, even during the later part of intra-operative and early post-operative course. In dexmedetomidine group, 10 patients reached RSS=2, one patient RSS =4 and none reached RSS>4 anytime during the observation period. In midazolam group, 17 patients reached RSS= 5, but none with RSS>5. Thus in our study, dexmedetomidine provided intra-operative sedation which was comparable to midazolam, and also prevented the risk of prolonged sedation in post-operative period. In addition, dexmedetomidine provided easy arousability. Similar results were found in studies conducted by M.Celik et al [7] and other authors [8,10,11].

In central nervous system, the locus ceruleus is the site of origin for the descending medullospinal noradrenergic pathway, known to be an important modulator of nociceptive neurotransmission. Dexmedetomidine acts as an agonist to α_2 receptors present on this site in brain and spinal cord[12]. Thus its analgesic effects could be mediated through supraspinal, spinal and peripheral actions. A study performed by J-Y. Hong et al [13] described improved post-operative analgesia in patients premedicated with IV dexmedetomidine 1mcg/kg. In our study, the duration of post-operative analgesia was prolonged in group D as compared to group M. But the total number of analgesics required in 24 hours was comparable in both the groups. This indicates that the patients from dexmedetomidine group remained pain-free for longer duration than the patients of midazolam group in the immediate post-operative period but dexmedetomidine did not offer any advantage over midazolam with respect to analgesia in a 24 hours period because of its shorter half life.

The present study suggested that use of single dose of 0.05 mcg/kg dexmedetomidine intravenously prolonged the duration of sensory blockade without affecting the duration of motor blockade. Kaya F.N. et al[11] also observed similar finding in their study. However, in studies conducted by Al-Mustafa MM et al[14] and K. Elcicek et al[10], prolongation of motor along with sensory blockade was noted with use of dexmedetomidine as 1 mcg/kg loading dose followed by maintenance infusion. This can be attributed to continuous infusion following loading dose in their studies. The prolonged duration of sensory block of spinal anaesthesia, by intravenous dexmedetomidine can be attributed to its supra-spinal and direct analgesic actions. Clonidine, an alpha-2 agonist, inhibits impulse conduction more in the large, myelinated Aα fibers than the small, unmyelinated C fibers. Thus conduction of motor nerve fibers is less inhibited than sensory nerve fibers at the same concentration of clonidine [15]. This same theory might explain the sensory but not motor block prolongation with dexmedetomidine as well.

The ideal sedation provides patient comfort and maintenance of spontaneous respiration without altering airway function. Dexmedetomidine is known to cause no or minimal respiratory depression. However, midazolam can cause apnea and arterial desaturation in sedative doses. Yongskin Liang et al [8] observed respiratory depression and intervention in midazolam group but not in dexmedetomidine group. There was no evidence of respiratory depression in any patients of either group in our study. Also the respiratory rates in both the groups were comparable at any time during the observation period.

In the present study, decrease in pulse rate and mean arterial pressures from the baseline were observed in both the groups after infusion of respective drugs, because of release of anxiety and sympathetic blockade. But, the decrease in heart rate was more significant in dexmedetomidine group. This could be explained by further decreased sympathetic outflow and circulating levels of catecholamines that are caused by dexmedetomidine [3]. Nine (30%) patients out of 30 in group D developed bradycardia and were given atropine while none in midazolam group had bradycardia. The fall in mean arterial pressure was statistically more significant in midazolam group. However, none of the patients in either group required treatment with ephedrine. This might be attributed to sufficient preoperative hydration in both the groups. Thus clinically the difference in the two groups with regards to mean arterial pressures was not significant, though

statistically significant.

In conclusion, a single dose of intravenous dexmedetomidine 0.5 mcg/kg when given intravenously as premedication for bupivacaine-induced spinal anesthesia provides arousable and stable sedation, without affecting respiratory parameters, and better post-operative analgesia, as compared to intravenous midazolam 0.05 mg/kg. It also prolongs the duration of sensory blockade. However bradycardia needs to be taken care of.

Conflicts of Interest

None

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Original Article

Received on 21.09.2016, **Accepted on** 12.10.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.2

A Comparative Study to Know the Effects of Insertion of LMA Vs ETT on Heart Rate in Children Undergoing Elective Surgery

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Abstract

Introduction: This prospective comparative trial was under-taken to compare the effects of insertion of laryngeal mask airway (LMA) and Endotracheal tube on heart rate response, evaluate the safety and efficacy of LMA as an airway device, and evaluate the changes in heart rate in pediatrics patients undergoing elective surgeries under general anaesthesia. *Material and Methods:* 60 cases which met all the inclusion criteria were selected and the study was carried out on patients of ASA I and II, aged 2 - 14 years of either sex, weighing 3-45kg undergoing elective surgery Group-L: LMA for airway management Group-E: Endotracheal Tube (ETT) for airway management. *Results:* Both ETT and LMA cause increase in heart rate (HR), but the magnitude and duration of response is less in LMA. The heart rate response to LMA insertion has reached the basal values in 3 minutes where as in endotracheal group it was still higher even in 5 minutes. Mean difference in the heart rate at different intervals with that of basal values showed significant results. *Conclusion:* Heart response is less and short lived with LMA as compared to endotracheal intubation. Therefore LMA is a suitable alternative to endotracheal intubation for elective surgical procedures in paediatric patients.

Keywords: Heart Rate Response; Laryngeal Mask Airway; Endotracheal Intubation; Children.

Introduction

Airway management is of utmost importance during delivery of general anaesthesia. Laryngoscopy and tracheal intubation or laryngeal mask airway insertion are noxious stimuli which provoke a transient but marked sympathetic response manifesting as hypertension and tachycardia. The laryngeal mask airway (LMA) was developed by British anaesthetist Dr Archie I. J. Brain in 1983 [1]. LMA was approved by the FDA in 1991, and its use in airway management has been gaining popularity ever since [2].

Direct laryngoscopy by activating proprioceptors, induces arterial hypertension, tachycardia and increased catecholamine con-centration proportional to the intensity of stimulus exerted against the base of the tongue [3]. The Laryngeal Mask Airway is designed to establish effective seal around the laryngeal inlet with an inflatable cuff. It is a useful advancement in airway management [4]. The LMA is one of the most promising non-pharmacolog-ical methods to attenuate the sympatho-adrenal response to tracheal intubation, causing less sympathetic response and catecholamine release [5].

The LMA causes less pressure response during insertion compared to tracheal intubation and the increase in heart rate is very short lived [6,7]. Recently there is increasing use of LMA in children because of ease of insertion and removal as compared to endotracheal intubation with minimal disturbances in cardiovascular and respiratory system and lesser risk of airway injury during the perioperative period [8]. Wilson IG et al found that insertion of the LMA has smaller cardiovascular responses than those after laryngoscopy and endotracheal intubation and it is useful in those patients who has marked pressor response [9].

The objective of the present study is to determine the heart rate response elicited by laryngoscopy and endotracheal intubation and compare it with that elicited by laryngeal mask insertion in ASA I and ASA II patients, undergoing elective surgeries in children.

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Methodology

After obtaining approval from hospital Ethical Committee, details of the procedure was explained to the patient's guard-ian and a written informed consent was taken. 60 cases which met all the inclusion criteria were selected for the study. The study was carried out on children of ASA I and II, aged 2 – 14 years of either sex, undergoing elective surgeries were randomly allocated to one of the two groups of 30 patients each. Group L (n = 30) LMA-classic group. Group E (n=30) Endotracheal tube- intubation group. All patients were assessed clinically preoperatively and investigated to rule out any systemic diseases.

All patients were premedicated with Inj. Glycopyrolate 0.004mg/kg IV, Inj.Ondansetaron 0.1mg/kg IV, Inj. Midazolam 0.03mg/kg IV, Inj.Tramadol 1mg/kg IV and were pre-oxygenated for three minutes. Induction of anaesthesia was done with Inj. Propofol 2mg/kg IV. Intubation / LMA insertion was facilitated by using Inj. Succinylcholine 1.5 mg/kg IV. Patients were ventilated with 100 percent oxygen for a brief period and intubation with the aid of Macintosh laryngoscope or insertion of LMA was carried out. Time taken for intubation or insertion of LMA did not exceed 20 seconds. Anaesthesia was maintained with intermittent positive pressure ventilation with Nitrous oxide and Oxygen (66:33), Halothane (0.5%-1%) and Inj. Vecuronium 0.1mg/kg IV.

Surgery was not allowed to commence till the study was completed i.e. for 5 minutes after intubation / insertion. At the end of surgery residual neuromuscular block was reversed with the mixture of Inj Glycopyrolate 0.008 mg/kg IV and Inj Neostigmine 0.05mg/kg IV.

Monitoring of HR, before induc-tion as baseline, after intubation or placement of LMA, at 1mins, 3mins and 5mins. For both the groups, baseline value for ETCO2 was taken after place-ment of airway devices (ETT/ PLMA). For statistical analysis of data between groups' students 't' test was used. Results were considered statistically significant for p values <0.05. SPSS 16.0 version was used for statistical analysis.

Results

The observations were compiled and the results were presented in tables, graphs. The demographic data was comparable in both the groups. There was no statistically significant difference.

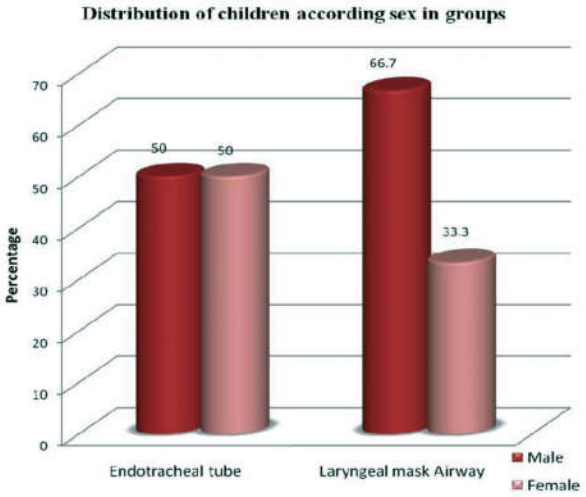

Fig. 1: Sex-wise distribution of the study participants

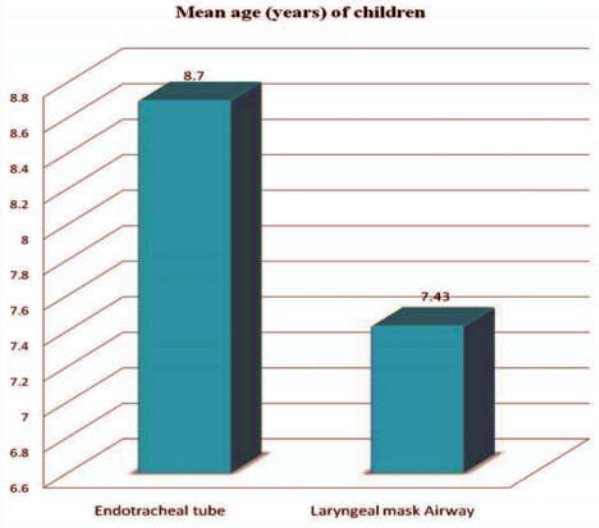

Fig. 2: Distribution of study participants according to mean age

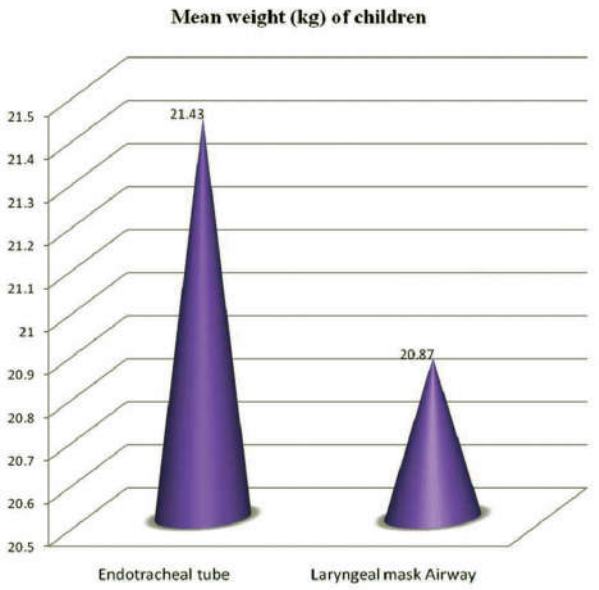

Fig. 3: Distribution of study participants according to mean weight

Table 1: Mean heart rate at different times among ETT and LMA study participants

Parameters	ETT	LMA	Mean difference	95% CI	p value
Baseline	100.2±14.7	101.5±15.3	1.27	-8.99–6.46	0.744
Pre Induction	110.9 ± 15.6	104.9 ± 15.9	6.03	-2.11–14.17	0.143
0' minute	135.6±13.4	116.2±13.5	19.4	12.45–26.35	0.0001
1' minute	132.8±12.1	113.7±20.9	19.17	10.29–28.04	0.0001
3' minute	122.5±12.9	107.0±12.8	15.5	8.85–22.15	0.0001
5' minute	113.5±10.9	100.4±13.4	13.17	6.85–19.48	0.0001

Table 2: Mean difference in heart rate at different times with basal heart rate among ETT and LMA study participants

Parameters	ETT	LMA	p value
Pre - Induction	-11.06±7.99	-3.43±4.07	0.0001
0' minute	-35.43±11.6	-14.76±3.68	0.0001
1' minute	-32.63±12.22	-12.2±19.23	0.0001
3' minute	-22.33±12.74	-5.56±7.69	0.0001
5' minute	-13.33±12.36	1.1±5.76	0.0001

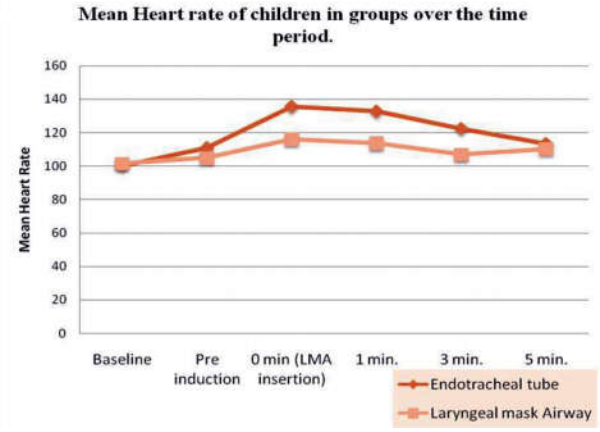

Fig. 4: Mean heart rate of study participants in both groups over the time

Table 1 show that heart rate in both the groups which were recorded at baseline, pre-induction, 0, 1, 3 and 5 minutes. There was no significant difference in heart rate at baseline and pre-induction recordings. Heart rate remained high in ETT group at 0, 1, 3 and 5 minutes as compared with LMA group. The difference was statistically significant ($p<0.05$).

Table 2 shows that mean difference in heart rate at different time intervals with that of basal values, is much lower in LMA group as compared with that of ETT group, and which is highly statistical significant ($p < 0.01$).

Discussion

This prospective comparative trial was conducted to com-pare LMA as an alternative airway device to ETT in 60 pae-diatric patients undergoing elective surgery. The LMA has been proved to be adequate in previous studies by Sinha A. et al. 2007 [10]; Patel et al. 2010[11]; Lalwani et al, 2010 [12].

We compared the LMA with ETT in terms of mean heart rate and also mean difference in the heart rates at different intervals of time pre-induction, zero, one, three and five minutes with that of basal values. The anthropometric (height, weight) data was comparable in both the groups. The pre-induction values in both the groups were comparable and there was no statistically significant difference between them ($p<0.05$).

Patel et al 2010, [11] found that there was no change in haemo-dynamic parameters in Group PLMA during insertion and removal of the ProSeal LMA whereas there was rise in both heart rates during insertion and extubation in ETT group, and the change was statistically highly significant. In our study, heart rate was increased in both the groups after placement of the air-way devices but the magnitude and duration of increase in HR was less in LMA group than in ETT group.

Garima Agrawal (2011)[13], found that following insertion of endotracheal tube, there was a highly significant rise in heart rate ($P=0.000$) but there was no significant rise in the heart rate ($P=0.921$) in the PLMA group.

Dave et al, [14] also found rise in heart rate after insertion of the PLMA which was statistically insignificant ($P>0.05$) but in our study the rise in heart rate after insertion of PLMA was found to be highly significant (<0.01).

Shahin N Jamil et al, [8] have performed randomized prospective study to examine the effects of tracheal intubation and LMA insertion in children of age 2 to 10 years. They found that heart rate

increased significantly in both groups after insertion of ETT / LMA ($p<0.01$). This increase in heart rate persisted up to 5 minutes in Group A was 105.7±8.3 (ETT group), while it came to baseline 107.2±9.3 within 3 minutes in Group B (LMA group) 7, where as in our study changes in heart rate was significant at 0,1,3,5 minutes.

The heart rate increased significantly in both groups after insertion of ETT/ LMA ($p<0.01$). This increase in heart rate persisted up to 5 min in Group A (ETT group), while it came to baseline within 3 min in Group B (LMA group). The mean changes in heart rate at 0, 1, 3 min were highly significant in Group A as compared to Group B ($p<0.001$, <0.001, <0.05 at 0, 1 and 3 min respectively), similar to the findings of our study [2].

Mehernoor F. Watcha et al [15] compared the heart rate responses and found that immediately after insertion of the ETT airway device; there was a significant increase in HR above baseline values. In contrast, there were no significant differences in HR compared with baseline values in the LMA group 22. Where as in our study mean difference in heart rate at different intervals of time showed significant rise compared with baseline values, but in ETT group values were more compared with LMA group.

In conclusion, we can say that during routine pediatric use, LMA provides a satisfactory airway for PPV. Heart rate response is less and is short lived with LMA as compared to endo-tracheal intubation. Mean difference in heart rate at different intervals is more in ETT group compared to LMA group.

Limitations

- Number of cases in each group was only thirty (30), to find statistical significance in these groups will be very difficult as it may not show the actual outcomes.
- A Randomized Controlled Trial, triple blinded or double blinded in nature, involving a large number of patients with long term follow-up is clearly needed to bring the differences between the two tech-niques.

Conflicts of Interest: None

Source of Support: Nil

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Original Article

Received on 17.09.2016, **Accepted on** 24.09.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.3

A Comparative Study of Tracheal Intubating Conditions without Muscle Relaxants between Propofoland Sevoflurane Induction

Shoji Koshy*, Ramesh K.**

Abstract

Introduction: Non-depolarizing neuromuscular blocking agents are alternative but are slower in onset and have a prolonged neuromuscular blockade [3] and also an inability to reverse the paralysis quickly if airway management via mask or tracheal intubation is not possible. *Methodology:* The study group consisted of 80 patients of both sexes, between the age of l-10years and belonging to ASA Physical status 1 and 2 who were scheduled for cleft lip/cleft palate/cleft alveolus surgery under general anaesthesia. *Results:* Regarding position of vocal cords, they were open in 50% of children, moving in 35% and closing in 15% of children in group A. In group B, vocal cords were open in 72.5% moving in 20%, closing in 5% and closed in 2.5% of children. *Conclusion:* A combination of sevofluranehad more acceptable intubating conditions compared to combination of propofol.

Keywords: Sevoflurane; Propofol; Intubation.

Introduction

Endotracheal intubation is the most important and crucial step during administration of general anaesthesia. It is more so in paediatric patients, especially, if there are associated deformities in and around the airway like cleft lip and palate.

Insufflation of trachea for the purpose of ether anaesthesia was introduced in 1909 in USA and 1912 in UK [1]. As surgical procedures got more and more complicated and prolonged, tracheal intubation became a part of anaesthesia practice. It was usually performed under deep inhalation anaesthesia with ether. The same technique was continued with halothane and of late, sevoflurane is gaining attention especially in paediatricanaesthesia practice.

Neuromuscular blocking agents to aid tracheal intubation were first introduced into clinical practice in 1942 in USA [1]. Neuromuscular blocking agents have made technique of endotracheal intubation much easier, but not without risks of subjecting the patient to potential risks. Until early 1990, suxamethonium was the only drug for facilitating tracheal intubation due to its rapid onset and ultra short duration of action, but it has many potential problems like myalgia, elevated intraocular and intracranial pressure, hyperkalemia, prolonged apnea, masseter spasm and malignant hyperthermia [2]. In United States (1993), FDA advised that suxamethonium was contraindicated for routine use in children and adolescents [3]. The justification was the increased incidence of fatal or near fatal cardiac arrest in children who had received suxamethonium. Most of the cardiac arrests were attributed to hyperkalemia in patients with undiagnosed muscular dystrophies, triggered after use of suxamethonium [4].

Non-depolarizing neuromuscular blocking agents are alternative but are slower in onset and have a prolonged neuromuscular blockade [3] and also an inability to reverse the paralysis quickly if airway management via mask or tracheal intubation is not possible [2]. They leave sympathetic responses unaltered and there is a potential for failed intubation [3]. The excessive or unnecessary neuromuscular blockade contributes to awareness under general anaesthesia, residual paralysis and sometimes allergic reactions [5]. So avoiding muscle relaxants when they are not required for planned procedure may prevent complications of their use, misuse and antagonism. With these reasons, a method of providing good intubating conditions rapidly without using

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muscle relaxants has been sought.

Since the advent of potent short acting opioid drugs and newer intravenous induction agents which are good in suppressing airway reflexes, possibility of intubating the trachea without muscle relaxants has been under evaluation. The most favourable drug for this purpose is propofol, due to its profound depressant effect on airway reflexes [6]. It decreases pharyngeal and laryngeal activity and muscle tone [7,8]. Induction with propofol is quick and smooth with rapid awakening and orientation during recovery [9].

On the other hand, of all inhalational agents available, sevoflurane is one drug with its relatively pleasant smell, low airway irritability and low blood gas solubility, less myocardial depression and arrhythmogenecity, promises such intubating conditions. Currently, sevoflurane is hailed as the inhalational agent of future. With this background, study was conducted to compare the intubating conditions achieved with sevoflurane and propofol.

Methodology

Inclusion Criteria

1. Pediatric patients, aged 1-10 years, both sexes, undergoing cleft lip, cleft palate and cleft alveolus surgery under general anaesthesia
2. Children belonging to ASA PS I & II.

Exclusion Criteria

1. Children with history of significant cardiac, respiratory, renal, hepatic or central nervous system diseases.
2. Children with history of sensitivity to the drugs used.
3. Children with anticipated difficult airway.
4. Children with active or recent upper respiratory tract infection.

The study of evaluation of endotracheal intubation without muscle relaxants in children undergoing cleft lip, palate and alveolus surgery: a comparative study sevoflurane and propofol was undertaken. The study group consisted of 80 patients of both sexes, between the age of l-10years and belonging to ASA Physical status 1 and 2 who were scheduled for cleft lip/cleft palate/cleft alveolus surgery under general anaesthesia.

The following groups of patients were excluded from the study, if they had history of significant cardiac, respiratory, renal, hepatic or central nervous system diseases, children with history of sensitivity to the drugs used, children with anticipated difficult airway, children with active or recent upper respiratory tract infection.

A thorough pre-anaesthetic evaluation was done to assess the general condition and status of cardiovascular, respiratory and central nervous system.

Routine investigations like hemoglobin percentage, total leucocyte counts, differential leucocyte counts, bleeding time, clotting time and chest X-ray was done and checked. A written informed consent was taken from parents.

Results

Statistical analysis of age, weight and sex distribution was done by using student's unpaired-t test. A p-value of less than 0.05 was regarded as significant. Both groups were found to be statistically similar with respect to age, weight and sex distribution.

Duration of intubation was similar in group A and Group B. p-value (0.495) not significant.

17.5% children in group A required 2 or 3attempts forintubationcompared to 5% in group B children.

Table 1: Age distribution

Group	Mean	Standard deviation	p- value
A (n= 40)	551	2.995	0.978*
B (n= 40)	4.53	3.137	

*Not significant

Table 2: Distribution based on weight

Group	Mean	Standard deviation	p- value
A (n= 40)	14.96	4.926	0.950*
B (n= 40)	14.01	5.065	

*Not significant

Table 3: Gender Distribution

Group	A	B	Total
M	23	23	46
F	17	17	34
Total	40	40	80

Table 4: Average duration of intubation

Time taken for intubation (s)	Group	N	Mean	Standard Deviation	P-value
	A	40	14.60	3.225	0.495*
	B	40	15.25	5.047	

* Not significant

Table 5: Number of attempts for intubation

			No of attempts for intubation			Total
			1	2	3	
Group	A	Count	33	6	1	40
		% within group	82.5%	15.0%	2.5%	100.0%
		% of total	41.3%	7.5%	1.3%	50.0%
	B	Count	38	2	0	40
		% within group	95.0%	5.0%	0.0%	100.0%
		% of total	47.5%	2.5%	0.0%	50.0%

Chi-Square = 3.352p-value=0.187 not significant

Table 6: Overall intubating conditions

Group	Number of patients		p-value
	Clinically acceptable	Clinically unacceptable	
A	21	19	0.0015
B	35	5	

Chi square = 10.05

Table 7: Intergroup comparison of Laryngoscopy

			Laryngoscopy		Total
			Easy	Difficult	
Group	A	Count	38	2	40
		% within group	95.0%	5.0%	100.0%
		% of total	47.5%	2.5%	50.0%
	B	Count	40	0	40
		% within group	100.0%	0.0%	100.0%
		% of total	50.0%	0.0%	50.0%

Chi-Square=2.05, p-value =0.152 not significant.

Table 8: Intergroup comparison of Vocal Cords

			Vocal cords				Total
			Open	Moving	Closing	Closed	
Group	A	Count	20	14	6	0	40
		% within group	50.0%	35.0%	15.0%	0.0%	100.0%
		% of total	25.0%	17.5%	7.5%	0.0%	50.0%
	B	Count	29	8	2	1	40
		% within group	72.5%	20.0%	5.0%	2.5%	100.0%
		% of total	36.3%	10.0%	2.5%	1.3%	50.0%

Chi-Square=6.289, p-value= 0.098 not significant

Table 9: Intergroup comparison of Coughing

			Coughing				Total
			Noun	Slight	Moderate	Severe	
Group	A	Count	22	0	13	5	40
		% within group	55.0%	0.0%	32.5%	12.5%	100.0%
		% of total	27.5%	0.0%	16.3%	6.33%	50.0%
	B	Count	32	4	1	3	40
		% within group	80.0%	10.0%	2.5%	7.5%	100.0%
		% of total	40.0%	5.0%	1.3%	3.8%	50.0%

Chi-Square=16.638, p-value= 0.001 not significant

Table 10: Intergroup comparison of Jaw relaxation

			Jaw relaxation		Total
			Complete	Stiff	
Group	A	Count	39	1	40
		% within group	97.5%	2.5%	100.0%
		% of total	48.8%	1.3%	50.0%
	B	Count	40	0	40
		% within group	100.0%	0.0%	100.0%
		% of total	50.0%	0.0%	50.0%

Chi-Square= 1.013, p-value= 0.314 not significant.

Table 11: Intergroup comparison of Limb movements

			Limb movement				Total
			Noun	Slight	Moderse	Severe	
Group	A	Count	15	12	10	3	40
		% within group	37.5%	30.0%	25.0%	7.5%	100.0%
		% of total	18.8%	15.0%	12.5%	3.8%	50.0%
	B	Count	31	6	1	2	40
		% within group	77.5%	15.0%	2.5%	5.0%	100.0%
		% of total	38.8%	7.5%	1.3%	2.5%	50.0%

Chi- square = 15.129, p-value = 0.002 significant a

Intubating conditions were clinically acceptable in 52.5% of patients in group A compared to 87.5% in group B, which is highly significant (p-value 0.0015).

In group A, laryngoscopy was easy in 95% of children and 100% in group B children. The two groups were comparable with respect to laryngoscopy. (p-value>0.152, not significant).

Regarding position of vocal cords, they were open in 50% of children, moving in 35% and closing in 15% of children in group A. In group B, vocal cords were open in 72.5% moving in 20%, closing in 5% and closed in 2.5% of children. The two groups were comparable with respect to vocal cord position, (p-value >0.098, not significant).

55% of children in group A had no coughing, while 32.5% patient and moderate coughing and 12.5% had severe coughing after intubation. Group A children had no coughing in 80%, slight coughing in 10%, moderate coughing in 2.5% and severe coughing in 7.5% of children respectively. Children in group A had more coughing than in group B, which is significant (p-value = 0.001).

Jaw relaxation was complete in 100% in group B compared to 97.5% in group A children. Both groups were comparable with respect to jaw relaxation (p-value > 0.314, not significant).

Limb movements were absent in 37.5%, slight in 30.0% moderate in 25% and severe 7.5% patients in group A. In group B 77.5% children didn't move, 15% slightly moved, the remaining 2.5% of children had moderate and severe movement. Children in group A had more limb movements than in group B, which is highly significant. (p-value = 0.002 highly significant).

Discussion

Laryngoscopy and tracheal intubation are essential skills associated with practice of anaesthesia. It is said that for successful intubation it requires patient to be either deeply anaesthetized, paralyzed or anaesthesiologists stronger than patient.[7] The drugs should be combined in such a way that it produces unconsciousness, analgesia and muscle relaxation without compromising

hemodynamic stability, at the same time providing best intubating conditions. Usually a combination of hypnotic agent, opioid and a neuromuscular blocking agent is used.

Over past few years, several factors have led researchers to ignore neuromuscular blocking agents for tracheal intubation. The driving force were introduction of propofol, short acting opioids and sevoflurane in clinical practice. Propofol not only suppresses upper airway reflexes and pressor response to laryngoscopy and tracheal intubation [6,7] but also provides faster recovery of consciousness, possess antiemetic action and reduces incidence of airway complications.

Sevoflurane, a new inhalational agent with low blood-gas solubility and a relatively pleasant odour produces rapid induction and recovery. It causes less myocardial depression and cardiac arrhythmias than haiotliane.

Newer potent short acting opioid such as fentanyl, alfentanilor remifentanil produce intense analgesia and decrease the pressor response and facilitates laryngoscopy and intubation when given with propofol.

Although, succinylcholine is the gold standard to provide adequate relaxation because of its rapid onset within 30-60s and quick metabolism, routine use of this drug has been questioned following several reports of cardiac arrest in young children. In addition it has many other potential problems myalgia, cardiac arrhythmias, elevated intraocular and intracranial pressure, hyperkalemia, malignant hyperthermia and prolonged apnea [2,4].Non-depolarizing neuromuscular agents are alternatives but are slower in onset and have a longer duration of action. They can produce awareness, allergy, failed intubation and residual paralysis.

In our study, we used a combination of oral midazolam 0.5mg/kg and atropine 20 μ g/kg. Midazolam 0.5mg/kg has rapid onset of action around 30 mins, provides adequate anxiolysis with mild sedative effects. Me Millan CO et al [9] also studied different doses of midazolam for oral premedication in children 1-6yrs of age and found that oral midazolam 0.5rng/kg is a safe and alternative premedication in providing anxiolysis, while 0.75mg/kg and lmg/kg did not provide any additional benefits and may cause more side effects like dysphoric reactions, blurred vision. Suresh C et al [10], Almenrader N et al [6] also used oral midazolam in doses of 0.5mg/kg to compare with oral ketamine and oral clonidine respectively and found this dose to be effective.

Studies have shown that pretreatment with 0.6mg of midazolam i.v 5 min before administration of 7% sevoflurane in 66% nitrous oxide via a face mask permitted good intubating conditions with an average time of only 2.5 mins in 70 kg healthy young adults [11]. Similarly, premedication with oral midazolam in our study could have improved the intubating conditions due to MAC sparing effects of midazolam which has resulted in better outcome.

In our study, we used fentanyl 2/g/kg, 5mins before induction, because in addition to analgesia, it also blunts pressor response against laryngoscopy and intubation. Fentanyl also has antitussive action. It has a peak effect around 6.8mins. Katohet al [12] suggested that fentanyl blocks afferent nerve impulses arising from stimulation of the pharynx, larynx and lungs during intubation. High concentrations of opioid receptor are present in the solitary nuclei and nuclei of the 9th and 10th cranial nerves, associated with visceral afferent fibers of the nerves originating in the pharynx, larynx and lungs. Through these receptors fentanyl provides antitussive effects. It may also prevent bucking after tracheal intubation by its antitussive effects.

Lignocaine has been used as an adjunct in adult and paediatric studies. It has been shown to attenuate the pressor and heart rate response to laryngoscopy and tracheal intubation. Dose related antitussive effect of lignocaine is important as it improves intubation scores. This is evident in a study done by Davidson et al [13]. They showed that addition of lignocaine lmg/kg improved intubating conditions when used with propofol in combination with alfentanil. We used lignocaine 0.2mg/kg to prevent pain on injection with propofol [3].

In our study, we chose to evaluate tracheal intubating conditions i 50 seconds after the start of induction for both sevoflurane and propofol. The timing of tracheal intubation is complicated by the lack of reliable end points. Depth ofanaesthesia is also difficult to assess clinically, with some anaesthetists using clinical indicators such as constriction and centralization of pupils, acceptance of face mask, while others have found eye signs unreliable [14]. A previous evaluation of sevoflurane [12,13] had found significantly greater time for tracheal intubation (243.4s), (242.2 ± 52.67s) and (325.93 ± 44.02). This difference was not only because of different clinical end points but also a different induction technique in which sevoflurane concentration was increased incrementally and ventilation was not assisted manually.

Addition of 60% nitrous oxide reduces the MAC of sevoflurane by 24% [19], and fastens the onset of time of induction. 7.5% Sevoflurane in nitrous oxide and oxygen (41s) had reduced induction time by 15% compared to sevoflurane in oxygen alone (48s) using a single breath induction technique [15]. Similarly, using a vital capacity rapid inhalational induction, the induction time was (55s) for 4.5% sevoflurane in 66% nitrous oxide with oxygen and (81s) for sevoflurane in oxygen [16]. Induction time was faster with immediate *8%* sevoflurane in 70% nitrous oxide (37s) than incremental 8% sevoflurane in 70% nitrous oxide (70s) [17].

Similarly, the induction time to achieve 80% successful intubation was 137s and 187s with 8% sevoflurane in 60% nitrous oxide with oxygen, between l-4yr and 4-8yr respectively. Thus, it has been shown that faster induction time (l min 12s) can be achieved by breathing 8% sevoflurane initially rather than incremental increase in vapor concentration [14]. In our study, the high initial concentration of 8%) sevoflurane in 66% nitrous oxide with manually assistedventilation could have accounted for the faster time to successful intubation than in previous studies [12,13].

The peak effect of propofol from the time of administration of drug was around 90-100s; Me Keating et al [6] study, showed that it is possible to perform laryngoscope safely and smoothly at 120s after induction with propofol. Therefore we took 150s as a fixed time interval from the start of induction to intubation to facilitate in comparing the two groups. The use of fixed time interval tests an easily reproducible technique, independent of subjective assessments of depth of anaesthesia.

In our study, tracheal intubation was accomplished in 87.5% of children receiving fentanyl and propofol and only 52.5% of those children had acceptable intubating conditions. Two factors that made the intubating scores unacceptable in our study were coughing (45%) and limb movements (32.5%). 37.5% of patients required additional dose of 1.53mg/kg propofol to achieve intubation because of coughing, excessive limb movements.

Akhilesh Gupta et al [18] in his study found that acceptable intubating conditions was achieved in 25%, 80% and 90% of children in each group. They found that 60% and 15% of children had coughing and 30% and 5% of children had limb movements after intubating with 2.5mg/kg and 3.0mg/kg of propofolrespectively.

Uma Srivastavaet al [19] showed acceptable intubating conditions in 67.5% of children when fentanyl 1/g/kg and propofol 3mg/kg was given in combination. 2.5% of the patients had vigorous coughing and 30% patients had limb movements.

Similarly Blair et al [20] with propofol 3mg/kg and alfentanil 10/g/kg achieved 52.5% acceptable intubating conditions in unpremedicated children. The results they obtained were similar to our study. They showed that coughing and limb movements were less common in propofol-succinylcholine group than in propofol- alfentanil group.

From the above studies, overall intubating conditions were significantly better in group B than in group A. In group A after initial dose of 3 mg/kg of propofol, 37.5% of pateinets required mean additional dose of 1.5 mg/kg propofoil at 150s to facilities intubation. In group A, two patients required succinylcholine for intubation because of excessive and limb movements during intubation. In group B, two patients requires succinylcholine for intubation due to laryngospasm.

Conclusion

A combination of 8% sevoflurane in 50% nitrous oxide with oxygen preceded by fentanyl 2/g/kg without muscle relaxants had more acceptable intubating conditions compared to combination of propofol 3mg/kg preceded by fentanyl 2/g/kg in children undergoing cleft lip, palate or alveolus surgeries

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Original Article

Received on 17.06.2016, **Accepted on** 24.09.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.4

Effects of Propofol and Sevoflurane on Haemodynamic Changes

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Abstract

Introduction: Heart rate does not change after induction dose of propofol because it resets or inhibits the baroreceptor reflex, thus reducing tachycardia response to hypotension. Propofol decrease the sympathetic activity to a greater extent than parasympathetic activity.

Methodology: A thorough pre-anaesthetic evaluation was done to assess the general condition and status of cardiovascular, respiratory and central nervous system. Routine investigations like hemoglobin percentage, total leucocyte counts, differential leucocyte counts, bleeding time, clotting time and chest X-ray was done and checked. A written informed consent was taken from parents.

Results: The systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were compared between the two groups following induction and intubation using unpaired student's t-test; statistically there were no significant differences between the two groups.

Conclusion: propofol and sevoflurane effectively blunted the systolic, diastolic and mean arterial pressure

Keywords: Propofol; Sevoflurane; Hemodynamic.

Introduction

Propofol is primarily a hypnotic and action is mediated by binding to the (3 subunit of $GABA_A$ receptor, thereby potentiating the γ-aminobutyric acid (GABA) induced chloride current conductance resulting in hyperpolarization and inhibition of postsynaptic neurons. During induction, 2-2.5 mg/kg of propofol produces 25-40% reduction in systolic BP, 20% decrease in stroke volume and 15-20%, decrease in systemic vascular resistance. Decrease in systolic BP is due to vasodilatation and myocardial depressant effects [1].

Propofol effectively blunts the magnitude of pressor response during laryngoscopy and intubation of trachea. Heart rate does not change after induction dose of propofol because it resets or inhibits the baroreceptor reflex, thus reducing tachycardia response to hypotension. Propofol decrease the sympathetic activity to a greater extent than parasympathetic activity [2].

Sevoflurane was first described in North America in 1971. It is halogenated fluorine (1,1,1,3,3,3, hexafluoroisopropyl fluoromethyl ether). It is non pungent and least airway irritant of all volatile anaesthetics.

Sevoflurane is an excellent choice for smooth and rapid inhalation induction in paediatric and adult patients because of its low blood solubility and non pungent odour. Similarly, upon discontinuation there will be rapid emergence due to rapid fall in alveolar anaesthetic concentration [3].

Sevofluratie mildly depresses myocardial contractility, decreases cardiac output. Systemic vascular resistance and arterial BP decline slightly. It causes [1] little rise in heart rate. It may prolong QT- interval.

Methodology

The study group consisted of 80 patients of both sexes, between the age of l-10years and belonging to ASA Physical status 1 and 2 who were scheduled for cleft lip/cleft palate/cleft alveolus surgery under general anaesthesia.

The following groups of patients were excluded from the study, if they had history of significant cardiac, respiratory,

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renal, hepatic or central nervous system diseases, children with history of sensitivity to the drugs used, children with anticipated difficult airway, children with active or recent upper respiratory tract infection.

Pre-Anaesthetic Evaluation and Preparation

A thorough pre-anaesthetic evaluation was done to assess the general condition and status of cardiovascular, respiratory and central nervous system. Routine investigations like hemoglobin percentage, total leucocyte counts, differential leucocyte counts, bleeding time, clotting time and chest X-ray was done and checked. A written informed consent was taken from parents.

Premedication

All the patients were made to fast for 6 hours for solids and milk and 3 hours for clear fluids and premedicated with combination of midazolam 0.5 mg /kg and atropine 20/ μ g/kg orally 45 minutes prior to surgery.

Patients were randomly allocated using envelope method into 2 groups:

Group A (Propofol) and Group B (Sevoflurane). Patient was shifted to OT and i.v access was established. Sedation score was noted in the OT.

Preoperative baseline values of heart rate, blood pressure and oxygen saturation were recorded and infusion of crystalloid lactated ringer's solution was started according to "4-2-1" formula (based on body weight and hours of fasting).

Both the groups received 2/g/kg of fentanyl, over 30 seconds. After 5 minutes, Group A patients received 3 mg /kg of propofol. Lignocaine 0.2mg/kg was added to propofol solution to abolish pain on injection; speed of injecting propofol was about 30 mg/10 seconds. Group B patients received 8% sevoflurane via a face mask connected to, Mapelson F breathing circuit after priming the circuit with 8% sevoflurane.

Heart rate, blood pressures and oxygen saturation were monitored continuously and recorded at baseline, after propofol / sevofluraneinduction, during intubation, 1 min, 2 min, 5 min & 10 minutes after intubation.

Any stimulus including surgical stimuli was avoided for 10 minutes after tracheal intubation. Complications if any were noted down.

E_tCO_2 was maintained between 30 - 35 mmHg during the procedure. After intubation anaesthesia was maintained with 66% nitrous oxide in oxygen with 0.2% halothane. Muscle relaxant vecuronium 0.1 mg/kg i.v was given after 10 minutes of tracheal intubation.

Intubation times i.e. the time taken from insertion of laryngoscope into the oral cavity till the removal of laryngoscope, number of attempts of tracheal intubation was noted.

After completion of surgery with resumption of spontaneous respiratory attempts, neostigmine 0.05mg/kg and glycopyrrolate 0.01 mg/kg was given to reverse the residual neuromuscular blockade. Patients were extubated after adequate recovery from muscle power, reflexes and spontaneous respiration.

Statistical analysis was performed using Student's unpaired t-test to analyze for time taken for intubation, number of attempts for intubation, hemodynamic parameters between two groups and Chi-square test was used to analyze intubating conditions, complications between the two groups. A p-value less than 0.05 was regarded as significant.

Results

This shows the distribution of baseline heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP).

Table 1: Baseline HR

Group	Mean	Standard deviation	p- value
A	136.98	40.755	0.138*
B	149.28	32.178	

Table 2: Baseline SBP

Group	Mean	Standard deviation	p- value
A	109.70	14.936	0.871*
B	110.30	17.764	

Table 3: Baseline DBP

Group	Mean	Standard deviation	p- value
A	68.83	12.653	0.236*
B	**64.93**	16.315	

Table 4: Baseline MAP

Group	Mean	Standard deviation	p- value
A	75.75	11.399	0.226*
B	71.20	17.704	

*not significant

Table 5: Intergroup comparison of heart rate

Heart rate	Group	Mean	Standard Deviation	P-Value
Base line	A	136.98	40.755	0.138
	B	149.28	32.178	
After induction	A	114.18	24.365	0.001
	B	135.32	28.389	
After intubation 0 min	A	122.35	27.653	0.002
	B	141.65	25.304	
After intubation 1 min	A	119.78	24.627	0.003
	B	137.73	27.605	
After intubation 2 min	A	114.08	22.481	0.002
	B	132.25	27.519	
After intubation 5 min	A	109.03	19.197	0.003
	B	126.40	27.915	
After intubation 10 min	A	104.03	19.197	0.003
	B	119.90	26.500	

Table 6: Intergroup comparison of Systolic blood pressure

SBP	Group	Mean	Standard Deviation	P-Value
Base line	A	109.70	14.936	0.871
	B	110.30	17.764	
After induction	A	88.00	14.408	0.442
	B	90.73	17.037	
After intubation 0 min	A	98.10	15.546	0.087
	B	91.45	18.634	
After inbutation 1 min	A	95.88	12.847	0.977
	B	95.78	17.298	
After intubation 2 min	A	91.83	12.310	0.990
	B	91.78	21.000	
After intubation 5 min	A	86.68	16.448	0.307
	B	89.98	11.907	
After intubation 10 min	A	87.25	11.899	0.466
	B	89.25	12.512	

Table 7: Intergroup comparison of diastolic blood pressure

DBP	Group	Mean	Standard Deviation	P-Value
Base line	A	68.83	12.653	0.236
	B	64.93	16.315	
After induction	A	47.70	11.543	0.683
	B	48.90	14.486	
After intubation 0 min	A	53.18	13.160	0.222
	B	49.35	14.568	
After inbutation 1 min	A	51.13	9.809	0.623
	B	49.65	16.143	
After intubation 2 min	A	48.83	9.145	0.958
	B	48.70	11.732	
After intubation 5 min	A	44.98	6.941	0.681
	B	45.80	10.586	
After intubation 10 min	A	45.90	10.470	0.628
	B	47.18	12.860	

Table 8: Intergroup comparison of mean arterial pressure

MAP (Hg)	Group	Mean	Standard Deviation	P-Value
Base line	A	75.75	11.399	0.226
	B	71.20	17.704	
After induction	A	59.65	13.014	0.939
	B	59.43	13.387	
After intubation 0 min	A	65.28	12.918	0.234
	B	31.58	14.765	
After intubation 1 min	A	66.50	10.884	0.185
	B	63.05	12.165	
After intubation 2 min	A	63.05	9.871	0.926
	B	62.05	11.531	
After intubation 5 min	A	57.40	7.503	0.464
	B	58.78	9.127	
After intubation 10 min	A	57.35	10.163	0.429
	B	59.28	11.480	

Table 9: Intergroup comparison of SpO_2

SpO_2%	Group	Mean	Standard Deviation	P-Value
Base line	A	99.35	2.007	0 .465
	B	99.60	0.778	
After induction	A	99.95	0.221	0.306
	B	99.88	0.404	
After intubation 0 min	A	99.13	2.078	0.210
	B	96.55	12.718	
After intubation 1 min	A	99.40	1.257	0.220
	B	98.35	5.221	
After intubation 2 min	A	99.63	0.740	0.918
	B	99.65	1.331	
After intubation 5 min	A	99.80	0.516	0.581
	B	99.68	1.328	
After intubation 10 min	A	99.83	0.385	0.304
	B	99.93	0.474	

The statistical analysis of baseline heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure was done by student's unpaired t-test. The baseline heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were comparable between the groups.

(p- value =0.138, p- value =0.871, p-value =0.236, p-value=0.226).

There was a significant reduction in heart rate from baseline to post induction and post intubation, remained so throughout the study in group A, whereas in group B no much change in heart rate noted during post-0 induction and post – intubation.

The systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were compared between the two groups following induction and intubation using unpaired student's t-test; statistically there was no significant differences between the two groups.

SpO2 changes between the two groups

Both the groups were comparable with respect to S_pO_2. The children had oxygen desaturation in group B, S_pO_2 decreased to 30% in one patient and in the other two patients S_pO_2 decreased 60% and 70%. All were due to laryngospasm. Out of these, two patients required succinylcholine for intubation. In addition to this, one patienthad bronchospasm and one patient had excessive oral secretions. One patient in group B had desaturation upto 90% due to bronchospasm.

Discussion

In Group A, there was definite reduction in heart rate from baseline, post induction and post intubation. Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were decreased post induction and post intubation compared with baseline. Thus propofol decreased both heart rate and blood pressure which indicates there was decrease in cardiac output. So propofol effectively attenuated the hemodynamic response to intubation.

Similar results were found in other studies,Akhilesh Gupta et al [4] found a consistent and similar fall in MAP (16-18%) in all children receiving 2.5 mg/kg, 3.0mg/kg or 3.5mg/kg of

propofol preceded by fixed dose of fentanyl 3/g/kg. However children receiving 3.5mg/kg of propofol also had fall in HR (11%).

Uma Srivastavaet al [5] found significant decrease in HR and arterial pressure from baseline in children given propofol and fentanyl. Steyn et al [6]observed a no change in HR but found a significant fall in MAP after induction and following intubation with a dose combination of propofol 3mg/kg and alfentanil 15g/kg in children.

Blair et al [7] found a reduction in HR before intubation in children who received propofol 3mg/kg and alfentanil 10/g/kg. However, they did not mention about arterial blood pressure and HR changes after intubation.

Coghlanet al [8] compared propofol with or without alfentanil in healthy adult patients and found propofol (2.5mg/kg) alone caused significant increase in HR and MAP after intubation. The addition of alfentanil (20/g/kg) produced slight increase in MAP and no change in HR.

In the study by Davidson et al [9] HR and MAP was decreased after induction, and increased after intubation an all patients. However propofol-alfentanil-lignocaine combination attenuated MAP rise after intubation better compared to other groups. Alexander et al [10] found a significant reduction in HR and MAP in each group after remifentanil. However, no significant differences in MAP and HR were observed at any time in adult patients, who received propofol 2mg/kg with remifentanil either 2/g/kg, 3/g/kg, 4//kg respectively.

Similarly, McNeil et al [11] found that, post induction MAP reduced by 21% and 28% with remifentanil 2/g/kg or 4/g/kg when combined with propofol 2mg/kg respectively. Elvan Erhanet al [12] also found significant decreases in HR and MAP after induction and remained so even after intubation, when a combination of remifentanil 3/g/kg and propofol 2mg/kg was used in healthy adults. Taha et al [13] studied healthy adult patients after receiving propofol 2mg/kg- remifentanil 2/g/kg-lignocaine 1.5mg/kg combination and found significant reduction in HR and MAP post induction and post intubation. Aunetal [14] observed greater fall in MAP with propofol 2.5mg/kg (28-31%) than with thiopentone 5.0mg/kg (14-21%) post induction in children between 8months – 12 yrs.

From the above studies, it is found that propofol definitely causes reduction in HR and blood pressure following induction and attenuates hemodynamic responses to laryngoscopy and intubation. The decreases in HR and blood pressure in our study was due to synergistic effects of fentanyl and propofol. Fentanyl blunted hemodynamic response to laryngoscopy and intubation whereas propofol decreased sympathetic nervous activity.

In Group B study, tracheal intubation was accomplished in 92.5% of children receiving fentanyl 2//kg and 8% sevoflurane; only 87.5% of those children had acceptable intubating conditions compared to 52.5% in group A, which is highly significant. Three patients developed laryngospasm, two of whom required succinylcholine for intubation. Laryngoscopy was easy in 100% of children. Vocal cords were open in 72.5% and moving in 20%, closing in 2.5% and closed in 5% of children. In Group B, 80% children had no coughing, 1% had slight coughing, 2.5% moderate coughing and severe coughing in 7.5% of children. Jaw relaxation was complete in 100% in group B. Limb movements were absent in 77.5% children, slight movement in 15%, moderate and severe limb movements in 5% and 2.5% of the children respectively.

In Thwaiteset al [15] study, all children could successfully be intubated with 8% sevoflurane in nitrous oxide and oxygen at 150s. 91% children had excellent intubating conditions and 9% had good intubating conditions. They demonstrated that 8% sevoflurane with nitrous oxide in oxygen can provide acceptable intubating conditions at 150s. Blair et al [7] found that 87.5% of children had acceptable intubating conditions, after administering 8% sevoflurane in 60% nitrous oxide in oxygen. Intubation was attempted at 180mins. Among these! 45% of children had excellent intubating conditions. The results of this study are similar to our study. Laryngoscopy, vocal cord position, coughing, jaw relaxation and limb movements were significantly better in propofol-succinylcholine group than 8% sevoflurane group, however it was not significant.

In Swadiaetal [15] study, anaesthesia was induced with 60% nitrous oxide in oxygen and incremental increase in concentration of sevoflurane from 1-7%? Time interval from application of facemask to intubation was 242±52.67s. 80% of children had excellent intubating conditions. None had fair or poor conditions. 16% had tachycardia, 8% had bradycardia and 80% had hypotension. Complications like laryngospasm, bronchospasm were not observed.

Parmod Kumar Bithalet al [16] found thai time to reach clinical end point for intubation was 325.93 ± 44.02s. The acceptable intubating conditions were achieved in 81.25% of patients. One patient had

moderate coughing. Jaw relaxation was complete. None had limb movements. There was no significant difference in the assessment of laryngoscopy and vocal cords between halothane and sevoflurane.

In Inomata etal [17] study, 5% sevoflurane was compared with 2.5% sevoflurane in oxygen. They found that Time El 50 and Time El 95 for sevoflurane was 147s and 194s respectively using modification of Dixon's up and down method. No patients demonstrated coughing or laryngospasm in this study. In the Cros et al study [18], acceptable intubating conditions were achieved with 2.5 ± 0.7% of sevoflurane preceded by remifentanil 1/g/kg and infusion 0.25/g/kg/min. In 21 patients intubation was possible without muscle relaxants. Failures were due to coughing or bucking after tracheal intubation. Vocal cords were either relaxed or moving but never closed.

In O'Brien et al [19] study, 8% sevoflurane with 60% nitrous oxide was compared with 5% halothane with 60% nitrous oxide in oxygen. Intubation was successful in all children at 1st attempt. Time to reach clinical end point was 243.5s for sevoflurane. One patient in sevoflurane had excessive vocal cord movement. 7out of 20 children had ideal intubating conditions in the sevoflurane group.

Iamaroon A et al [20] study, compared sevoflurane 8%- nitrous oxide with thiopentone-succinylcholine in adults. Intubation was successful in all patients. 16.7% of patients in sevoflurane group had excellent and 76.6% had goodintubating conditions. Jaw relaxation was similar in both groups. Vocal cords were widely open in 28.4% - 43.4%, midposition in 48.3% - 65%, 2 patients had closed vocal cords. 21.7% - 48.3% of patients in sevoflurane had diaphragmatic movement. 11.7% - 21.7% had mild to moderate coughing. One patient exhibited severe coughing.

Conclusion

Both propofol and sevoflurane effectively blunted the systolic, diastolic and mean arterial pressure following intubation. However, propofol caused a significant reduction in heart rate response during post intubation periods compared to sevoflurane.

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Original Article

Received on 07.06.2016, **Accepted on** 16.06.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.5

A Comparative Study of 0.5% Vs 2% Lidocaine for Intravenous Regional Anaesthesia

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Abstract

Background: This study was conducted to compare efficiency of different concentrations of lidocaine in intravenous regional anesthesia in terms of onset and duration of sensory and motar blockade.

Methods: Sixty patients were divided in to 2 groups; the first group received 0.5% concentration of 30-40 ml of lidocaine and the second group received 2% of lidocaine 12-15ml.preoperative and intraoperative hemodynamic parameters were monitored and recorded at 1,5,10,20,30,40 minutes after anesthesia.

Results: The onset time of sensorial block was shorter and duration of sensorial block was longer in group 2 than group 1.the onset of motor blockade and duration of motor blockade was longer in group 2 than group 1.there was no comparatively significant differences in hemodynamic vital parameters in both groups.

Conclusions: IVRA with 2% ligocaine is effective and safer than the 0.5% ligocaine.

Keywords: IVRA; 0.5% Lignocaine; 2%Lignocaine; Regional Anaesthesia.

Introduction

Intravenous regional anesthesia (IVRA) since its birth in the hands o august bier in 1908 has become a valuable instrument in the repertoire of anaesthesiologists. Its reliable, simpleand safe method of providing anaesthesia for minor surgical procedures to the extremeties if its administered by experienced clinician.

It is generally administered as low concentration –high volume local anesthestic solution by intravenous route. Recently, administration of high concentration low volume local anesthestic solution has been suggested as an alternative.

It has been postulated that the site of action in IVRA is probably by blockade of small nerves or possibly nerve endings and not the major nerve trunks [7,8]

Materials and Methods

The study was conducted in RGSSH Hospital/RIMS Raichur over a period of 1year between January 2015 to February 2016. It is a prospective randomized controlled study which included 60 patients of ASA grade 1 and grade 2 of either sex aged between 20 to 60 for below surgeries .

Patients with history of allery to local anaesthetics, local infection, raynauds disease, sicke cell disease, thromboplebhitis of limb and not willing for the procedure were excluded from the study.

All patients were premedicated with inj. midazolam 0.05mg/kg i.v 15-20 minutes before surgery. Initial pulse rate, blood pressure and arterial oxygen saturations were recorded. Patients were divided in to two groups group 1 who received 12-15ml of 2% lignocaine and group2 who received 30-40 ml 0f 0.5% lignocaine based on toxic dose of lignocaine not exceeding 3mg/kg.

Technique of IVRA: Two i.v cannulas were secured one with 20G cannula in the dorsum of non operating hand on its dorsum to which iv fluid fluid connected at the rate of 75-100 ml/hr and the other with 22G cannula on the dorsum of operating hand.the arm was elevated above the level of head for 3 minute. Exsanguination was done by an Esmarch bandage from distal to proximal applying tightly. Two pneumatic tourniquets are placed on the arm over cotton padding. The promimal tourniquet cuff was inflated to a pressure of 250mm hg or 100mmhg above the systolic pressure of the patient and

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occlusion was confirmed by loss of radial pulse.

The first group received 2% of 12-15 ml of lignocaine i.v and the second group received 40 ml of 0.5% lignocaine i.v.

The following intraoperative parameters of the patients, systolic blood pressure(SBP),diastolic blood pressure(DBP), mean blood pressure, heart rate (HR) peripheral oxygen saturation (SpO_2) were recorded at 1,5,10,20,30 and 40 minutes. The onset of sensory block was determined by loss of pain to the pinprick every 30 seconds after the injection of drug in dermatomal distribution of each nerve. The onset of motor block was noted when patient was unable to move fingers after injection of the drug. The recovery time for sensory bock was recorded when patient recovered the pain sensation to pinprick after tourniquet release. The recovery time for motor blockade was recorded when paient regained the fingers movement. The period from release of tourniquet to the administration of analgesic was taken as time of analgesic administration. The visual analog scale(VAS) was used to evaluate tourniquet pain at 0,5,10,15,20 and 40 minutes after tourniquet inflation. Inj. Fentanyl 1µg/kg i.v given when VAS>3. Ramsay Sedation Score (RSS) was used to evaluate degree of sedation in patients at 5,10,20,30 and 40 minutes after tourniquet deflation. Tourniquet was not deflated before 45 minutes of Inj. Lignocaine injection and was not inflated more than 65-70 minutes after Lignocaine injection. Tourniquet was deflated using repeated inflation–deflation technique.

Statistical Analysis

In our study, sample size was calculated by pilot study. Confidence level of 5% was considered. Data were analyzed by using SPSS version 11and data were expressed as mean±standard deviation as number. Paired t- test and chi-square(X^2) were applied when appropriate. $p< 0.05$ was considered significant and $p<0.01$ was considered very significant.

Results

In the study there were no significant differences for demographic data among groups and tourniquet time (Table1).

Table 1: demographic data

	Group1	group2
Age	37.37±3.20	38.80±3.20
Gender	18/12	20/10
Weight	58.17±5.06	56.33±3.74
Surgical duration	38.67±4.97	38±4.73

Table 2: Comparision of parameters between different groups

	Group1	Group2	P Value
Onset time (min)of sensory block	3.00±0.83	4.57±0.62	0.00001*
Onset time of motor block(min)	6.00±0.83	8.00±0.83	0.00001*
Recovery time of sensory block(min)	53.50±3.51	46.00±2.55	0.00001*
Recovery time of motor block (min)	56.83±3.91	47.50±1.73	0.00001*
First time to complain tourniquet time	30.00±2.58(min)	35.83±2.65	0.00001*

*p<0.05 is significant.

Table 3: Incidence of complications between groups

	Group1	Group2	P
Insufficient block	0	2	0.1554*
Additional opioid	1	2	0.561*
Nausea and vomiting	2	1	0.581*

*p<0.05 is considered as significant

Onset time for both sensory and motor block were signicantly shorter and longer in group 1 than in group 2 ($p<0.00001$). The recovery time for sensory and motor block were significantly longer in group1 compared to group 2 ($p<0.05$)

The incidence of complications in the study were few and statistically insignificant.

Haemodynamic parameters such as systolic blood pressure(SBP), diastolic blood (DBP), mean arterial blood pressure and arterial oxygen saturation (SpO_2)

for both groups were similar at 1,5,10,20,30 and 40 minutes ($p>0.05$) which is clinically significant.

Discussion

Regional anaesthesia holds an important place in developing countries because of its simplicity, safety and economy. For anaesthesia of hand and forearm, intravenous regional anaesthesia, also called biers block, was first described by german surgeon august bier in 1908 [1].

Intravenous regional anaesthesia has since evolved as asafe, reliable, and cost effective technique for providing anaestheisa as well as bloodless field during upper limb surgery [2,3].

The onset time of sensory block in group 1 was 3.00±0.83 minutes as compared in group 2 4.57±0.62 minutes which was clinically significant ($p<0.05$).

The onset time of motor block in our study was 6.00±0.83 minutes in group1 and in group2 was 8.00±0.83 minutes. The different between two groups was found to be significant $p<0.05$.

In a study done by Mir A et al, the onset time of sensory and motor blockade was 5.35±1.18 minutes and 7.55±1.38minutes respectively using 0.5% lidocaine [4].

The recovery time of sensory block (from the time of administration of the drug) was 53.50±3.51 minutes in group 1 and in group2 it was 46.00±2.55 minutes. The recovery time of motor bock in group 1 was 56.83±3.91 minutes and in group2 it was 47.50±1.73 minutes.

In a study Ulus A et al found that the onset time and duration of sensory and motor block was shorter and longer in group receiving 2% lidocaine (12-15ml) than in group who received 0.5% 0f 30-50ml of lidocaine [5].

Regarding the complications, additional opioid requirement was seen in one patient in group 1 and two patients in group 2 respectively. Two patients in group1 complained of nausea and vomiting whereas one patient in group 2. Clinically there was no significant difference among two groups $p>0.05$.

Complications with intravenous regional anaesthesia were local anaesthetic toxicity, tourniquet pain, lack of post operative analgesia. Various modalities were tried to overcome these disadvantages like change of local anaesthetic, modification of technique and addition of adjutants[6].

Conclusion

Intravenous regional anaesthesia with 2% of 12-15ml of lignoocaine is effective and safer with early onset time of sensory and motor blockade along with longer duration of sensory and motor blockade as compared to 0.5% of 30-40ml of lignocaine.

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Original Article

Received on 11.11.2016, **Accepted on** 15.11.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.6

Comparison of Profile and Ease of Insertion of Laryngeal Mask Airway and Endotracheal Intubation in Children

Sayeda Noor Huzefa*, Shaila S. Kamath**

Abstract

The apparent lack of laryngeal stimulation makes the LMA a potentially attractive alternative for airway management in children with upper respiratory tract infection. Upto 40% of children presenting for anaesthesia have a recent upper respiratory tract infection (URI). Although there is an increased risk of perioperative respiratory complications after a recent URI, anaesthesiologists often proceed with their management for two reasons- It is uncertain how long to postpone the procedure after a URI, and there are adverse economic and emotional impacts resulting from cancellation of the procedure.

Children weighing between 10 to 20 kg undergoing operative procedures in Kasturba Medical College Hospital, Attavar, Kasturba Medical College Hospital, Ambedkar Circle, Government Wenlock Hospital were the study subjects.

The ease of insertion and number of attempts for insertion was compared in both groups.

It was found that intubation was successful in first attempt in 92% of patients in endotracheal tube group and in 84% of patients in laryngeal mask airway group

Keywords: Laryngeal Mask Airway; Endotracheal Intubation; Children.

Introduction

Although positive pressure ventilation (PPV) has been used with the LMA in infants and children without complications serious concerns remain about its safety as difficulty with insertion and malposition of the LMA may occur more commonly in infants and children. Malposition may cause airway obstruction and may also compromise the seal of the LMA cuff, causing gas leakage during PPV. Gas leakage during PPV may result in gastric distension andimpaired ventilation and increase the risk of regurgitation [1].

The LMA provides a more secure airway than can be obtained with a pharyngeal airway and a face mask in paediatric patients. The LMA bypasses the tongue and upper pharyngeal structures that cause upper airway obstruction in children. LMA may be a better choice for even brief procedures. In the situation where an anaesthesiologist is working alone (even if tracheal intubation is planned) and an inhalation induction is being performed, an LMA inserted after induction of anaesthesia may provide a secure airway while the anaesthesiologist is cannulating a vein prior to tracheal intubation [2].

The apparent lack of laryngeal stimulation makes the LMA a potentially attractive alternative for airway management in children with upper respiratory tract infection. Upto 40% of children presenting for anaesthesia have a recent upper respiratory tract infection (URI).Although there is an increased risk of perioperative respiratory complications after a recent URI, anaesthesiologists often proceed with their management for two reasons- It is uncertain how long to postpone the procedure after a URI, and there are adverse economic and emotional impacts resulting from cancellation of the procedure. Nevertheless, URI leads to airway hyperresponsiveness that results in a higher incidence of adverse respiratory events, a major cause of morbidity and mortality during paediatric anaesthesia, with hypoxemia, laryngospasm, and bronchospasm being the most frequently reported courses. To reduce the incidence of respiratory adverse events,the laryngeal mask airway (LMA) has been suggested as an alternative to tracheal intubation in children with recent URI [3]. In addition, reports

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suggest that the incidenceof postoperative sore throat associated with the placement of a LMA is much less than that associated with an ETT [4].

The LMA has been used for a variety of surgical procedures where previously the face mask was used. It has also come to replace the endotracheal tube for short procedures. The LMA is the ideal device in situations where it is inconvenient to hold the mask, as for procedures on the face and neck. Except for intra-abdominal major surgery, where we would expect a lot of stomach contents to move up, many other procedures like limb surgeries, plastic surgery, lower abdominal procedures and urology can all be done with LMA with spontaneous or controlled ventilation. It is always ideal to plan a regional anaesthetic along with LMA insertion, especially if the child is going to be breathing spontaneously. The LMA is especially appropriate when general anaesthesia is required for relatively non-invasive diagnostic or therapeutic procedures such as MRI, CT scanning, cardiac catheterization, nuclear scans, and radiation therapy. The complications and side effects of tracheal intubation can be avoided for these types of procedures. Other types of surgery for which the LMA has been useful include non-cavity invasive general surgery, orthopaedic surgery, plastic surgery and genitourinary surgery. The LMA is not a replacement for the tracheal tube; however, many paediatric patients have, in the past, been intubated simply because standard pharyngeal airways have not provided a secure enough airway. Each anaesthesiologist should review the indication for tracheal intubation in their paediatric patients to determine whether an LMA may provide a secure airway with minimal risk of side effects [5].

Methodology

Study Population

Children weighing between 10 to 20 kg undergoing operative procedures in Kasturba Medical College Hospital, Attavar, Kasturba Medical College Hospital, Ambedkar Circle, Government Wenlock Hospital.

Sample Size

All patients were divided into 2 groups of 50 individuals each by block randomisation (85% confidence level with 85% power).

Inclusion Criteria

- ASA physical status I or II, of either sex.
- Weighing between 10-20 kilograms.
- Scheduled for various elective surgical procedures of not more than 2 hours duration.

Exclusion Criteria

- Patient/ parent refusal
- History of or anticipated difficult intubation
- Patient with pharyngeal pathology
- Patients with known systemic illness related to any organ system.
- Surgical procedures of more than 2 hours duration
- ASA III and more
- Any upper airway surgeries

Results

The age and sex distribution was compared in both the study groups. The mean age group was 5.78 in intubated group and 5.92 in LMA group which was not significant. In LMA group 30% of children were females and 70% were males. Whereas in intubated group 26% were females and 74% were males.p=0.656 which was not significant.

The average weight distribution in LMA group was 15.04 and in intubation group was 16.54.

The ease of insertion and number of attempts for insertion was compared in both groups. It was found that intubation was successful in first attempt in 92% of patients in endotracheal tube group and in 84% of patients in laryngeal mask airway group. Two attempts for intubation were required in 4% of patients in endotracheal group and 16% of patients with laryngeal mask airway. Whereas intubation was successful after three attempts in 4% of endotracheal intubations, all the laryngeal mask airways were placed at 2 attempts. None of the patients required more than three attempts for intubation. There were no cases where intubation was impossible.

Table 1: Age distribution

Group	N	Mean	Std. Deviation	T
Endotracheal	50	5.92	1.614	.414
Laryngeal	50	5.78	1.765	p=0.68 ns

Table 2: Sex distribution

			Group		Total
			Endotracheal	LMA	
SEX	Female	Count	13	15	28
		%	26%	30%	28%
	Male	Count	37	35	72
		%	74%	70%	72%
	Total	Count	50	50	100
		%	100%	100%	100%

χ^2=0.198 p=0.656 not significant

Table 3: Weight

Group	N	Mean	Std. Deviation	t
Endotracheal	50	16.54	2.727	2.411
Laryngeal	50	15.04	3.452	p=0.018 sig

sig- significant

Table 4: Ease of insertion

		Group		Total
		Endotracheal	LMA	
Easy	Count	46	42	88
	%	92%	84%	88%
Difficult	Count	4	8	12
	%	8%	16%	12%
Total	Count	50	50	100
	%	100%	100%	100%

χ^2=1.515 p=0.218- not significant

Discussion

In our study we found out that placement of laryngeal mask airway was successful in first attempt in 84% of patients whereas endotracheal intubation was successful in first attempt in 92% of patients. Rest 16% of patients in laryngeal mask airways were placed successfully by the second attempt. Whereas 4% of endotracheal intubations required 2 and rest 4% of intubations required 3 attempts. None of the patients in either group required more than 3 attempts. In our study we found out that failure to successfully place laryngeal mask airway in first attempt was mostly due to displacement of airway after placement leading to significant leak requiring removing the laryngeal mask airway and replacing it, whereas most of the endotracheal intubations requiring more than one attempt was due to inability to visualise the vocal cords.The results of this study was comparable to other studies [6,7,8].

Conclusion

Laryngeal mask airway provides a suitable alternative to the endotracheal tube.

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Original Article

Received on 11.11.2016, **Accepted on** 15.11.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.7

A Study on Intubation among Pregnant Women Undergoing Cesarean Section

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Abstract

Introduction: The risk of failed intubation in obstetrics has been estimated to be eight folds compared to the general surgical cases (i.e.,) an incidence of 1:250 in obstetric compared to 1:20,000 in general surgical cases.As there is an attempt to lower caesarean section rates and a higher percentage are performed using regional technique individual practitioners have less experience with general anesthesia in obstetrics.

Methodology: 60 female patients were divided into two groups Group I consisted of 30 pregnant women posted for cesarean section under general anaesthesia. Group II consisted of 30 non pregnant women posted for General Surgeries under General anaesthesia.

Results: Cormack and Lehaneslar-yngoscopic view grading in both in group, in group I, 24 out of the 30 patients had Grade A (80%) compared to 28 out of the 30 patients in group II (93.3%).

Conclusion: Statistically significant changes were not seen in the Cormack and Lehanes grading of the laryngoscopic view.

Keywords: Intubation; Pregnancy; LSCS.

Introduction

The airway continues to be a significant management problem in the practice of obstetric anaesthesia. Difficult intubation, aspiration (often related to airway management) and a high incidence of substandard care are consistent finding in deaths directly attributable to anaesthesia [1,2].

It is encouraging that the overall anesthesia-related maternal death is small and has decreased significantly in recent decades. Much of this decrease has been attributed to the greater use of regional anesthesia which has a much lower death rate than that for general anaesthesia [3,4]. In fact 50 per cent of anaeshtesia related maternal mortality involves general anaesthesia despite the fact that general anaesthesia accounts for only 16 percent of anaesthetics for cesarean delivery. However, death rates for general anaesthesia may actually be increasing [3]. However, this may be to a trend to reserve the use of general anesthesia for the most emergent cesarean section.

The risk of failed intubation in obstetrics has been estimated to be eight folds compared to the general surgical cases (i.e.,) an incidence of 1:250 in obstetric compared to 1:20,000 in general surgical cases [5-8].

As there is an attempt to lower caesarean section rates and a higher percentage are performed using regional technique individual practitioners have less experience with general anesthesia in obstetrics [9,10]. Therefore, it is critically important to be aware of the problems (difficult airway management, aspiration), minimize the incidence of encountering problems, and be capable of instituting alternative management plans should difficulty be encountered. The goal in obstetric anaesthesia is 'Oxygenation Without Aspiration' [11].

Methodology

Source of Data

60 female patients were divided into two groups Group I consisted of 30 pregnant women posted for cesarean section under general anaesthesia. Group II consisted of 30 non pregnant women posted for General Surgeries under General anaesthesia.

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Inclusion Criteria

Group – I: Female patients aged 18-39 years of ASA grade I and II, pregnant at term, posted for LSCS with no obvious airway problem.

Group – II: Female patients aged 18-39 years of ASA grade I and II without any obvious airway problem requiring general anaesthesia.

Exclusion Criteria

Patients of ASA Grade III and IV

Patients with jaw tumours

Patients with obvious difficult airway

Results

In group I patients age ranged from 19 to 38 years with a mean of 25.53 years and standard deviation of 4.79. In group II patients age ranged from 18 to 38 years with a mean of 28.73 years and standard deviation of 5.94.

In group I weight ranged from 40 to 80kgs. With mean of 54.43kgs a standard deviation of 9.21, in group II weight ranged from 40 to 90kgs with a mean of 53.13 kgs and standard deviation of 9.97.

In group I weight ranged from 4 to 80 kgs with mean of 54.43kgs a standard deviation of 9.21, in group II weight ranged from 40 to 90 kgs with a mean of 53.13 kgs and standard deviation of 9.97.

Table 3 shows the Cormack and Lehaneslaryngoscopic view grading in both in group, in group I, 24 out of the 30 patients had Grade A (80%) compared to 28 out of the 30 patients in group II (93.3%).

In group I, 6 out of the 30 patients had Grade B (20%) compared to 2 out of 30 patients in group II (6.7%).

Using the Fischer's exact probability test there was no statistically significant difference in Cormack and Lehaneslaryngoscopic view between the groups (P>0.05).

Table 4 shows the Ease or difficulty in intubation in both the groups, in group I, 24 out of the 30 patients belonged to Grade 1 (80%) compared to 29 out of the 30 patients in group II (96.7%).

In group I, 5 out of the 30 patients belonged to Grade 2 (16.7%) compared to 1 out of 30 patients in group II (3.3%).

In group I, 1 patient belonged to Grade 3 (3.3%) no patients in group 2 belonged to grade 3.

A statistically significant difference in the ease or difficult in intubation between the groups was

Table 1: Age distribution in years

Groups	N	Mean	Std. deviation
Group I	30	25.53	±4.79
Group II	30	28.73	±5.94

Table 2: Weight distribution in kgs

Groups	N	Mean	Std. deviation
Group I	30	58.43	±9.21
Group II	30	53.13	±9.97

Table 3: Cormack and Lehanes grading of laryngoscipic view

		Group I	Group II	P	Remark
C&L Grade A	No. of patients	24	28	>0.05	NS
	% within group	80.0	93.3		
C&L Grade B	No. of patients	6	2	>0.05	NS
	% within group	6.7	20.0		
Total		30	30		

NS - Non-significant

Table 4: Ease or difficulty of Intubation

		Group I	Group II	P	Remark
Difficulty 1	No. of patients	24	29	< 0.05	S
	% within group	80.0	96.7		
Difficulty 2	No. of patients	5	1	< 0.05	S
	% within group	16.7	3.3		
Difficulty 3	No. of patients	1	-	< 0.05	S
	% within group	3.3	-		
Total		30	30		

S – Significant

observed using Fischer's exact probability test (P<0.05, one sided hypotheses).

A rank correlation co-efficient was used between the following groups.

1. Modified mallampati classification and Cormack and Lehaneslaryngoscopic view grading.
2. Wilsons-risk-sum values and Cormack and Lehaneslaryngoscopic co-relation coefficient r = 0.054 which is very highly significant P>0.001.

For mallampati and Cormack and Lehaneslaryngoscopic co-relation coefficicent r = 0.054 which is very highly significant P<0.001.

For Wilsons-risk-sum value and Cormack and Lehaneslarynogscopic grading co-relation co-efficient r=+0.558 which is very highly significant.

The above observation showed a high positive co-relation between above two classifications.

Discussion

Difficulty with tracheal intubation is a major concern for every anaesthesiologist. In the obstetric population the risk of failed intubation has been reported to be as great as 1 in 250 undergoing cesarean section, which is eight times the rate in the general surgical patient population. Such are the consequences of failed tracheal intubation that a number of attempts have been made to predict those patient in whom tracheal intubation will subsequently prove to be difficult. Risk factor identified at the pre-operative visit have been used to alert the anesthesiologist to that alternative methods of securing the airway can be used or additional experienced support obtained.

In the present study conducted in our institution we have compared the Airway changes in pregnant women coming for cesarean section under general anesthesia with non-pregnant women coming for cesarean section under general anesthesia with non-pregnant women coming for general surgical procedures requiring general anaestheisa. A total of 60 patients were chosen for the study and divided into two groups. Group I consisted of pregnant women for cesarean section and Group II consisted of non-pregnant women for general surgeries. In both the groups pre-operative assessment of the airway was carried out using Modified Mallampati's classification and Wilson's-risk-sum values. In both the groups Rapid sequence induction and intubation of anaesthesia was carried out and the view at laryngoscopy was assessed using Cormack and Lehanes grading of laryngoscopic view. The ease of difficulty in tracheal intubation was graded on a subjective scale.

We observed a general increase in the Modified Mallampati's score in pregnant women compared to the non-pregnant women which was statistically significant (P<0.01) No significant charges in the Wilson's-risk-sum values were noted in both the groups. Statistically significant changes were not seen in the Cormack and Lehanes grading of the laryngoscopic view. A statistically significant co-relation was found between increase in the Mallampati Grade and Wilsons Score with increase in the Cormack and Lehaneslaryngoscopic grading (P<0.01). We also observed a statistically significant increase in the difficulty of intubation in the pregnant group compared to the non-pregnant group (P<0.05).

Conclusion

Cormack and Lehaneslaryngoscopic grading does not seem to change much in pregnancy, though. This could be due to the Tracheal mucosal oedema seen as a part of physiological change in pregnancy.

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Original Article

Received on 11.11.2016, **Accepted on** 15.11.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.8

Airway Changes in Pregnant Women and Non Pregnant Women: A Comparative Study

M. Salim Iqbal*, Leelavathy P.B.*, Junaid Ahmed Desai, Shabbir Ali Mulla****

Abstract

*Introduction:*Two possible respiratory muscle strategies can be considered during pregnancy. 1) Higher inspiratory intercostal and accessory muscle recruitment, since the increased thoracic volume displacement and pleural pressure swings could also be a consequence of their enhanced action. 2) Similar relative contribution between the diaphragm and the inspiratory intercostal muscles, since the slope of the P_{ga} *versus* P_{oes} curve remains constant **.**

Methodology: Study was conducted in 60 female patients .These patients were divided into two groups Group I consisted of 30 pregnant women posted for cesarean section under general anaesthesia. Group II consisted of 30 non pregnant women posted for General Surgeries under General anaesthesia.

Results: the distribution of Wilson Risk-Sum-Values in both the groups. In groupI, 21 out of the 30 patients belonged to Wilson score 0 (70%) compared to 23 out of the 30 patients in group II (76.7%). In group I, 6 out of 30 patients belonged to Wilsons score 2 (10%) compared to 2 out of the 30 patients in group II (6.7%). Using chi-square test it was found that there was no statistically changes in Wilsons risk-sum-values between two groups (P>0.05).

Conclusion: The prediction of difficult airway in an obstetric patient is best done using Modified Mallampatti classification in the preoperative period

Keywords: Pregnancy; Airway Changes; Wilsons Risk-S um-Values.

Introduction

With pregnancy progression, the resting position of the diaphragm moves 5 cm upward with the increasing uterus size, as shown by chest radiograph measurement [1-3]. This causes the following changes to the diaphragm: its capability to generate tension increases secondary to muscle fibre lengthening; its area of apposition to the lower ribcage increases; and its radius of curvature increases, due to the progressive enlargement of the lower ribcage to give space to the lungs. In addition, the upward movement of the diaphragm causes FRC decrease.

The inspiratory movements of the diaphragm are similar or become even broader than postpartum [1,3], and trans-diaphragmatic pressure swings during tidal breathing do not change [2]. The diaphragmatic work may increase as a consequence to contract against higher load represented by higher end-expiratory P_{ga} and enlarged gravid uterus. This hypothesis is supported by the tension time index of the diaphragm, which falls after delivery [2].

During pregnancy, chest wall expansion is shifted toward the ribcage because of an enhanced coupling between abdominal pressure and the lower ribcage [3,4]. Thanks to the increased area of apposition, in fact, the abdominal pressure generated by the contraction of the diaphragm acts mainly on the lower ribs, thereby elevating and expanding the ribcage where the diaphragm is apposed.

Two possible respiratory muscle strategies can be considered during pregnancy. 1) Higher inspiratory intercostal and accessory muscle recruitment, since the increased thoracic volume displacement and pleural pressure swings could also be a consequence of their enhanced action [2,4]. 2) Similar relative contribution between the diaphragm and the inspiratory intercostal muscles, since the slope of the P_{ga} *versus* P_{oes} curve remains

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constant [2,4].

The progressive increment of the anterior abdominal dimension leads to morphological adaptation of the abdominal muscles by lengthening their fibres up to 115%, changing their line of action, altering their angle of insertion and reducing their thickness. The consequences are compromised functional ability, poor torque production and reduced ability to stabilise the pelvis against resistance. The latter may be implicated in back pain during pregnancy [5,6].

Methodology

Source of Data

Study was conducted in 60 female patients.These patients were divided into two groups Group I consisted of 30 pregnant women posted for cesarean section under general anaesthesia. Group II consisted of 30 non pregnant women posted for General Surgeries under General anaesthesia.

Inclusion Criteria

Group – I: Female patients aged 18-39 years of ASA grade I and II, pregnant at term, posted for LSCS with no obvious airway problem.

Group – II: Female patients aged 18-39 years of ASA grade I and II without any obvious airway problem requiring general anaesthesia.

Exclusion Criteria

- Patients of ASA Grade III and IV
- Patients with jaw tumours
- Patients with obvious difficult airway

Preoperative Period

All the patients were visited and evaluated thoroughly on the day of the surgery or previous day of surgery as regard to history and general physical examination.

The airway of the patients was then assessed pre-operatively using,

a. Modified mallampati's classification.

b. Wilson's-Risk-sum values.

Modified mallampati's classification was assessed by asking each patient to sit upright and to open her mouth widely the head in neutral position. The patient was then asked to protrude her tongue maximally. The observer was seated opposite the patient at eye level and an assessment was made of the oropharyngeal structures visualized. The view was then graded as follows.

Class I: Soft palate, fauces, uvula and tonsillar pillars visible.

Class II: Soft palate, fauces seen, tip of uvula obscured.

Class II: Soft palate and base of uvula seen.

Class IV: Soft palate not visible only hard palate seen.

Wilson-risk-sum values was then assessed. This scores five factors-weight, head and neck movement, jaw movement, receding mandible and buck teeth from 0 to 2 giving a total, ranging from 0 to 10.

Wilsons Risk-Sum Values

Risk Factors	Level
Weight	<90kg 90-110kg > 110kg
Head and neck movement	Above 90 degrees About 90 degrees (i.e,) ± 10 Deg. Below 90 degrees
Jaw movement subluxation > 0	Inter incisor Gap ≥5CM or Inter incisor Gap <5CM and subluxatin = 0 Inter incisor Gap <5CM and subluxation < 0
Receding mandible	Normal Moderate Severe
Buck teeth	Normal Moderate Severe

Head and neck movement was measured by asking the patient to extend fully the head and neck, while a pencil was placed to stand vertically on the forehead. The orientation of the pencil was adjusted so that it was parallel to a distant window frame.

Then, while the pencil was held firmly in position, the head and neck were fully flexed and pencil was sighted against the horizontal of the window frame to judge if it has moved through 90^0.

In jaw movement inter incisor gap and subluxation was assessed.

Inter-incisor gap was measured with the mouth fully open.

Subluxation was assessed as maximal forward protrusion of the lower incisors beyond the upper incisors.

The severity of receding mandible or long upper incisors (buck teeth) was estimated on a subjective scale.

Following preoperative assessment of the airway the anesthetic procedure to be undertaken (i.e.,) application of cricothyroid pressure-the sellick smanoeuvre was explained to the patients.

All the patients received injection Glycopyrolate 4µg/kg intramuscuarly along with injection Ranitidine 50mg intravenously and injection Ondansetron 4mg intravenously as premedication, half an hour shifting the patient to the operating room.

Intra-Operatively

Once the patient was shifted to operating room the patient was connected to the routine monitors which included ECG, Non-invasive blood pressure and pulse oximetry.

All resuscitation equipments like the intubation trolly with the airway, laryngoscopes, endotracheal tubes along with drugs necessary were kept ready. The anaesthesia machine was also checked along with the oxygen deliver system.

Baseline pulse rate, blood pressure were noted.

A standard induction and intubation protocol was listed for all patients. A rapid sequence induction and intubation was carried out in all patients.

After preoxygenation for 3 minutes with 100 percent oxygen, anaesthesia was induced with injection Thiopental 5mg/kg. I.V. followed by injection Succinylcholine 2mg/kg. I.V., cricoids pressure was applied by an assistant upon loss of consciousness and maintained until the trachea was intubated, the cuff inflated and correct tube location verified.

Larynogoscopy was performed after the disappearance of fasciculations in the face and neck muscles, using a#3 Macintosh blade.

During the rapid-sequence induction and intubation an assessment was made of the view at laryngoscopy as described by Cormack and Lehane.

The extent of exposure of the glottis was expressed on a scale of A to D as follows.

Grade A: Most of the glottis visible.

Grade B: Only posterior extremity of glottis visible.

Grade C: No part of glottis visible only the epiglottis is visible.

Grade D: Not even the epiglottis is visible.

After laryngoscopy, the trachea was intubated and subjective assessment of the ease or difficulty of intubation was made according to the following scale.

Grade 1: Easy intubation at first attempt, no difficulty.

Grade 2: Some difficulty, insertion of gracheal tube not achieved at first attempt but successful after adjustment of laryngoscope blade and / or adjustment of head position but not requiring additional equipmet, removal and reinsertion of laryngoscope or senior assistance.

Grade 3: Very difficult, requiring removal of laryngoscope, further oxygen by mask ventilation and subsequent intubation with or without the use of an introduction stylet, an alternative laryngoscope blade or intubation by senior colleague.

Grade 4: Failed intubation, including failure to pass the tracheal tube after several attempts or unrecognized oesophageal intubation with subsequent tube placement by a senior anaesthesiologist.

Results

Table 1: Shows the ASA grading for the each group in Group I, 23 out of the 30 patients belonged to ASA-I, an incidence of 76.7 percent and 7 patients belonged to ASA-II an incidence of 23.3 percent, in Group II, 24 out of the 30 patients belonged to ASA I giving an incidence of 80 percent and 6 patients belonged to ASA-II an incidence of 20 percent. Distribution of ASA

grading was not statistically significant between the groups using chi-square test (P>0.05).

Table 2 shows the distribution of modified mallampati's classification in both the groups. In group I, 9 patients out of the 30 belonged to mallampati classification grade I (30%). In group II, 21 out of the 30 patients belonged to mallampati grade I (70%). In group I, 12 out of the 30 patients belonged to mallampati grade II (40%). In group II, 6 out of the 30 patients belonged to mallampati grade II (20%). In group I, 9 out of the 30 patients belonged to mallampati grade III (30%) and 3 out of the 30 patients belonged to mallampatis grade III (10%).

A statistically highly significant changes was seen in mallampati grading between group I and group II using the chi-square test (P<0.01).

Table 1: ASA-physical status distribution

ASA-grade		Group I	Group II	P	Remark
ASA I	No. of patients	23	24	>0.05	NS
	% within group	76.7	80.0		
ASA II	No. of patients	7	6	>0.05	NS
	% within group	23.3	20.0		
Total	No. of Patients	30	30		

NS - Non-significant

Table 2: Modified mallampatis classification

		Group I	Group II	P	Remark
Mallampati I	No. of patients	9	21	P<0.01	HS
	% within group	30.0	70.0		
Mallampati II	No. of patients	12	6	P<0.01	HS
	% within group	40.0	20.0		
Mallampati III	No. of patients	9	3	P<0.01	HS
	% within group	30.0	100.0		
Total	No. of Patients	30	30		

HS – Highly significant

Table 3: Wilson risk-sum-values

		Group I	Group II	P	Remark
Wilson score 0	No. of patients	21	23	P<0.05	HS
	% within group	70.0	76.7		
Wilson score 1	No. of patients	6	5	P<0.05	HS
	% within group	20.0	16.7		
Wilson score 2	No. of patients	3	2	P<0.05	HS
	% within group	10.0	6.7		
Total	No. of Patients	30	30		

NS - Non-significant

Table 3 shows the distribution of Wilson Risk-Sum-Values in both the groups. In groupI, 21 out of the 30 patients belonged to Wilson score 0 (70%) compared to 23 out of the 30 patients in group II (76.7%).

In group I, 6 out of 30 patients belonged to Wilsons score 2 (10%) compared to 2 out of the 30 patients in group II (6.7%). Using chi-square test it was found that there was no statistically changes in Wilsons risk-sum-values between two groups (P>0.05).

Discussion

In this study was compared the airway changes in pregnant women coming for ceasarean section with non-pregnant women coming for general surgeries during general anaesthesia.

This prospective study was conducted in Sixty female patients between the age group of 18 to 39 years of ASA Grade I and II, were selected and divided into two groups of 30 each.

Group I consisted of 30 pregnant women who underwent cesarean section under general anaesthesia.

Group II consisted of 30 non-pregnant female patient who underwent general surgeries under general anaestheia.

Pre-operative assessment of the airway was carried out in both the groups using.

1. Modified mallampatis classification.
2. Wilsons Risk-sum values.

A standard induction and intubation protocol was used for all the patients (i.e.,) Rapid sequence induction and intubation.sss.

During Rapid-Sequence induction and intubation an assessment was made of the view at laryngoscopy as described by Cormack and Lehane.

After laryngoscopy the trachea was intubated and a subjective assessment of the ease or difficulty of intubation was made.

In our study it was noted that there was a general increase in the modified mallapatisocre in pregnant women compared to non-pregnant women. As depicted in Table 4, using the modified mallampati test as modified by Samsoon and Young 70 percent of the non-pregnant patients were described as Class I, compared to 30 percent in pregnant patients. 20 percent of the non-pregnant patients were described as Class II compared to 40 percent in pregnant patients. 10 percent of the non-pregnant patients were described as Class III, compared to 30 percent in pregnant patients.

This is similar to the result obtained by S. Pilkington et al. (1995) [7] who concluded that there was an increase in Mallampati score during pregnancy.

In our study there was no significant difference in the Wilsons Risk-sum values between both groups.

Cormack and Lehane (1984) [8] have noted that difficult laryngscopy in pregnant women was fairly rare which correlates well without study as in our study there was no significant variation in the Cormack and Lehaneslaryngoscopic grading in both the groups.

In our study it was observed that there was a general increase in the degree of difficulty in visualizing the larynx as assessed by Cormack and Lehanes grading with the increase in modified mallampati score. D.A. Rockeet at. (1992) [9], Oates et al. (1991) [10] and C.M. Frerk (1991) [11] noticed a general increase in degree of difficulty in visualizing the larynx with increase in modified mallampatis score which co-related well with our study.

Oates et al. (1991) [10] and Wilson et al. (1988) [12] noticed an increase in degree of difficulty during intubation in pregnant women compared to non-pregnant women which is similar to the conclusion of King TA et al. (1990) [13], Samsoon and Young (1997) [14] who concluded that there was an increase in the incidence of difficult intubation in pregnant women compared to non-pregnant women.

Conclusion

The prediction of difficult airway in an obstetric patient is best done using Modified Mallampatti classification in the preoperative period. Wilsons score does not help us much in predicting the difficulty to intubate in an obstetric patient.

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Case Report
Received on 19.09.2016, **Accepted on** 12.10.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.9

Caesarean Section in a Case of Systemic Lupus Erythematosus

Deepak M. Kokane*, Kiran Todkari**

Abstract

Systemic lupus erythematosus is characterized by chronic, inflammatory, multi-organ symptoms caused by immune complexes and auto antibodies. The disease is having wide clinical presentation involving cardiovascular system, respiratory system, gastrointestinal system, renal, hematologic, central nervous system, musculoskeletal and dermatologic system pathologies. Commonly the onset of this disease is in the third to fourth decade of life. In pregnancy systemic lupus erythematosus may exacerbate causing spontaneous abortions, intrauterine death, pre-eclampsia and eclampsia, intrauterine growth retardation, preterm delivery. This case report summarizes the peri-operative course and anaesthetic management in a parturient with SLE with bad obstetric history who underwent elective caesarean section [LSCS].

Keywords: Autoimmune; LSCS; Pregnancy; Systemic Lupus Erythematosus; ANA.

Case Report

A 20 year old woman (G2A1P0L0) with 38 weeks gestational age, diagnosed with SLE was scheduled for elective caesarean section in view of cephalo-pelvic disproportion.

Patient had the systemic symptoms during the first trimester such as oral ulcerations with difficulty in deglutition and sometimes bleeding through the lesions. During antenatal checkups, she was investigated in view of bad obstetric history and a diagnosis of SLE was made. She was found to be ANA (antinuclear antibody) positive but negative for antiphospholipid antibody.

Her complete blood counts (CBC), blood sugar, urine examination were normal. Liver and renal function tests (LFT, RFT), electrocardiograph (ECG) were further ordered to rule out any systemic involvement and were found to be normal.

To improve the foetal outcome, she was receiving enoxaparin 50 mg subcutaneously twice daily and then after that once in a day reaching to term. She was being monitored by serial bleeding time (BT), clotting time (CT) and activated partial thromboplastin time (APTT) measurements. In view of bad obstetric history, an elective caesarean section was planned at term. Injection enoxaparin was with held 24 h prior to surgery. Preoperative investigations revealed a normal BT, CT, APTT and PT/INR.

Patient was shifted to the operation theatre. In view of normal coagulation profile, regional anaesthesia was planned. 18G iv line was secured and patient was preloaded with 500 ml of Ringer lactate. Vital monitoring was carried out through oxygen saturation (SpO_2), heart rate, noninvasive blood pressure and ECG and foley's catheter was placed to measure hourly urine. Inj. Hydrocortisone 100mg iv was given.

Subarachnoid neuraxial block was performed using 2 ml of 0.5% Bupivacaine (heavy) in lateral position with 25G Quincke's needle under aseptic precautions. Blockade was achieved at T6 dermatome level. Baby cried immediately after birth with normal APGAR score and no signs of neonatal lupus seen. Inj. Oxytocin 20IU in 500 ml DNS was started. The surgery was uneventful with minimal blood

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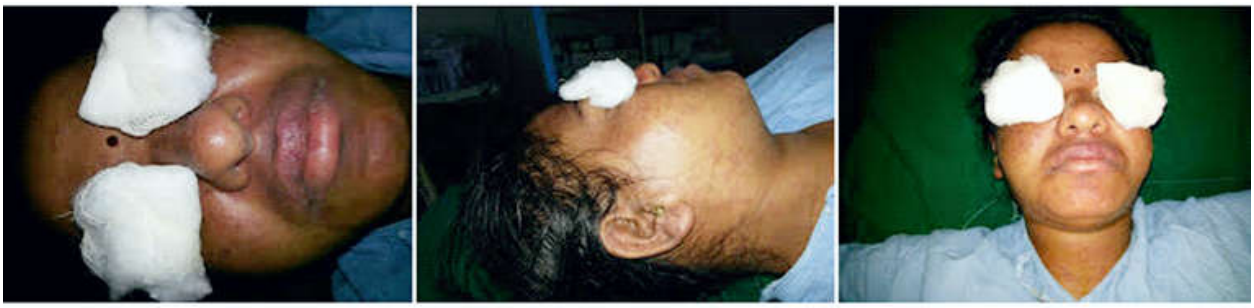

loss. After full recovery patient was shifted to the ward and enoxaparin injections were restarted after 24 h.

Discussion

SLE was first documented in the Middle Ages when it was termed lupus ('wolf' in Latin) to describe the appearance of the classical facial (malar) rash. Others have suggested that the disease may have been named after a veil used by women in France to cover facial blemishes [1]. The pathogenesis of SLE is complex. There is formation of immune complexes and antibodies against cell surface molecules or serum constituents [2]. Many auto antibodies have a pathogenic role, targeting DNA, RNA, cell membrane structures, the cellular surface and intracellular molecules [3]. Organ inflammation and consequent damage results from autoantibody production and dysfunctional immune system. The level of involvement of organ system varies. For diagnosis of SLE, clinical criteria formulated by the American College of Rheumatology (ACR) are useful. According to it, patient must exhibit at least four of following eleven features—serositis, oral ulcers, arthritis, photosensitivity, haematological abnormalities, renal pathology, presence of immunologic disorders, positive ANA, neurologic disorders, malar rash, discoid rash [4]. Extensive preoperative assessment is needed due to extensive and multiple organ dysfunction. Cardiovascular system is involved in SLE in the form of atherosclerosis, coronary artery disease, myocardial infarction, valvular heart disease, and stroke. So we should investigate like chest X-ray, echocardiography, ECG [5]. Hematologic pathologies may present in the form of anaemia, thrombocytopenia and leukopenia, assessed by studies like complete blood count, prothrombin time and partial thromboplastin time.

Anti-DNA molecules also attack the central nervous system leading to mood changes, cognitive impairment [6] whereas antiphospholipid antibodies causes stroke, seizures, migraine [7]. So EEG and a CT scan may be necessary. Renal system pathology may present in form of glomerulitis, nephritic syndrome, renal failure evaluated by urinalysis, renal USG and scan, BUN level, creatinine, albumin and total serum protein levels [8]. Respiratory involvement may include acute pnemonitis, chronic alveolar infiltrates, recurrent infectious pneumonia, and alveolar haemorrhage. So one should do chest X-ray, pulmonary function tests and arterial blood gas analysis [9]. Difficult intubation is anticipated and there is possibility of cricoarytenoid arthritis, laryngeal pathology, temporo-mandibular joint dysfunction, mucosal ulceration [2].

Antiphospholipid syndrome may co-exist with SLE in which there is recurrent systemic arterial and venous thrombosis, abortions, thrombocytopenia [9]. Bleeding may occur due to reaction of antibodies with clotting factors like factor VIII, IX, XII. So DVT prophylaxis and investigations like complete coagulation profile are necessary [10]. During pregnancy, SLE increases risk of pre-eclampsia, infections, preterm birth, IUGR.

Many laboratory studies, imaging studies and histologic tests are available for diagnosis of SLE. Positive ANA is the most sensitive test for SLE screening while anti-dsDNA and anti-Smith antibodies are more specific to SLE [4]. Disease severity and organ involvement determine a suitable treatment regimen. It includes antimalarials, glucocorticoids, NSAIDs, immunosuppressive, cytotoxic and biologic agents [11,12].

Pregnancy outcome of patients with antiphospholipid antibody improves when they receive heparin and low dose aspirin but studies are going on such trials in patients with positive ANA [13]. To reduce blood loss heparin therapy is withheld at the time of delivery and restarted after delivery. Ideally we should give heparin for 6 weeks postpartum [14]. Intra operatively and

postoperatively we should monitor for bleeding and thromboembolic complications. Plan of anaesthesia should be decided after explaining to the patient risks and benefits of general and regional anaesthesia. Role of paediatrician is also significant as there are chances of neonatal SLE.

Conclusion

Anaesthetic management of SLE patients is challenging. Extensive preoperative assessment is necessary because of wide ranging clinical presentations of SLE .Careful anaesthetic planning and intra-operative monitoring of all affected organ systems particularly renal, pulmonary and cardiovascular system function are required. If multi systems are not involved, regional anaesthesia is better than general anaesthesia in view of patient's betterment.

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Case Report
Received on 18.06.2016, **Accepted on** 28.10.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.10

Acute Pneumothorax After Induction of General Anaesthesia

K.K. Mubarak*, James Chacko, Shilpa Jose***, Arun Sujat*****

Abstract

Acute pneumothorax occurring under general anaesthesia with positive pressure ventilation especially when using nitrous oxide can rapidly become life-threatening tension pneumothorax. As the diagnosis is often difficult or delayed in this situation, a high index of suspicion and clinical examination aided by monitors are necessary for the diagnosis, which may be confirmed by radiography or ultrasonography. Immediate stoppage of nitrous oxide with prompt release of the pneumothorax by needle aspiration or intercostals drainage is needed to save the life of the patient. This is a case report of an un-anticipated acute pneumothorax which occured soon after the induction of general anaesthesia, which was diagnosed and managed successfully in time.

Keywords: Acute Pneumothorax; General Anaesthesia; Nitrous Oxide.

Introduction

Pneumothorax is air in the pleural cavity which can occur unexpectedly under general anaesthesia. Diagnosis may be difficult or delayed due to the limited access to chest and the non-specific early clinical signs. Positive pressure ventilation and use of nitrous oxide can make it into a tension pneumothorax quickly. Hence early detection and prompt management is necessary to save the life of the patient.

Case Report

A 52 year old housewife presented with neck pain radiating to the left upper limb of 3 months duration. MRI scan showed subluxation of the C5-C6 cervical vertebrae with radiculopathy, (Figure1) for which she was posted for anterior cervical discectomy and fusion. She was weighing 60 Kg, with no other significant medical problems. She had a short neck with cervical collar and airway was of modified Mallampatti Class III. Routine investigations including chest radiograph and electrocardiogram were normal.

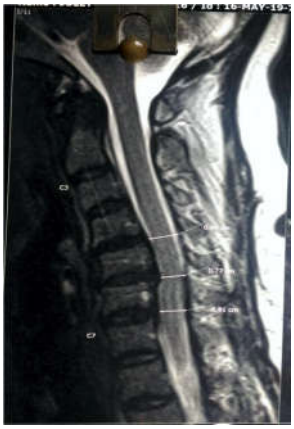

Fig. 1: MRI scan of neck showing subluxation of C5-C6 cervical vertebrae

In the operation theatre baseline heart rate 86/ min, blood pressure 130/84 mm Hg and SpO_2 100% on room air were recorded. Intravenous premedication was given with glycopyrrolate 0.2 mg, midazolam 1 mg, ondansetron 4 mg and fentanyl 100µgm. After preoxygenation, general anaesthesia was induced with propofol 120 mg followed by lignocaine 100 mg and succinylcholine 100 mg. Endotracheal intubation was done by 7 mm cuffed flexometallic tube with the help of bougie and bilaterally equal air entry was confirmed.

Capnograph showed normal tracing with end-tidal carbon dioxide ($EtCO_2$) of 34mm Hg. Vecuronium 4 mg was given intravenously to maintain neuromuscular blockade and anaesthesia maintained with IPPV using oxygen, nitrous oxide and isoflurane using workstation in volume control mode at a rate of 12/min, tidal volume 500ml, I:E ratio 1:2, PEEP 3 cm H_2O. Intravenous infusion of dexmedetomidine at a rate of 20

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µgm per hour was started for analgesia.

Within 5 minutes, there was sudden drop in SpO_2 to 88%, $EtCO_2$ to 28 mm Hg with tachycardia of 134/min and drop in BP to 110/74 mm Hg. Immediately nitrous oxide and isoflurane was stopped and manually ventilated with 100% oxygen. The reservoir bag was feeling tight with markedly diminished air entry over the left side. As the clinical condition was worsening the surgical procedure was deferred and patient was transferred to Intensive Care Unit with ambu bag ventilation using oxygen enriched air. Clinical re-assessment showed hyper-resonant left hemithorax with obliterated cardiac dullness and absent air entry. The patient was put on mechanical ventilator in volume control mode with 100% oxygen at a rate of 12/min, tidal volume 500ml, I:E ratio 1:2, PEEP of 0 cm H_2O with peak airway pressure limited to 24 cm H_2O. Chest radiograph showed massive pneumothorax on the left side with mediastinal shift to the right (Figure 2). A 12 lead ECG taken was unremarkable, except for tachycardia.

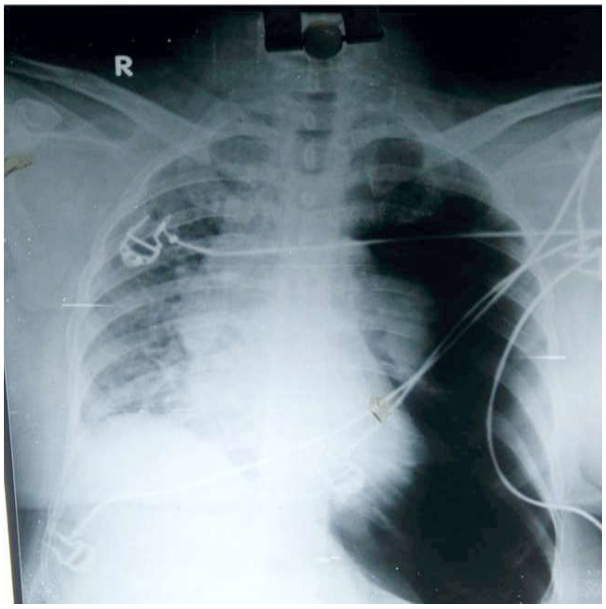

Fig. 2: Chest radiograph showing pneumothorax on the left side with mediastinal shift to the right

Immediately intercostal drainage (ICD) tube was inserted into the left pleural cavity and connected to underwater seal, which showed air bubbling, following which the clinical condition improved. Emergency fiberoptic bronchoscopy was done, which did not detect any airway injuries.

In three hours, the vital status improved, SpO_2 picked up to 95%, and air entry was better. Repeat radiograph confirmed the position of ICD tube and showed re-expansion of the lungs. Patient was extubated after six hours and ICD was removed after three days, when the lungs were fully expanded, as confirmed by radiograph. The patient was discharged from ICU with advice for High Resolution Computerized Tomography (HRCT) before taking up for surgery later.

Discussion

Pneumothorax occurring under general anaesthesia is life-threatening as it can rapidly turn into a tension pneumothorax. During positive pressure ventilation air enters into the closed pleural cavity, causing collapse of the lungs, which is worsened by the rapid diffusion of nitrous oxide causing mediastinal shift resulting in cardiovascular collapse. Prompt diagnosis and urgent insertion of intercostals drainage tube is often needed to save the life of the patient.

Pneumothorax during anaesthesia can occur due to rupture of bullae, violent cough causing airway tear, alveolar rupture or rupture of esophagus. Iatrogenic causes may be due to application of high peak inspiratory pressure (>40 cm H_2O), large tidal volume and high positive end-expiratory pressure (PEEP). Trauma during intubation, overinflation of ETT cuff, stylet protruding beyond ETT and movement or coughing during intubation or extubation are other contributing factors. In patients with reduced lung compliance, IPPV can produce barotraumas even without application of high airway pressures. Surgical complications or diagnostic procedures like central venous cannulation or brachial plexus block can also result in pneumothorax.

Signs of pneumothorax like fullness of hemithorax, absent breath sounds, distended neck veins with tracheal shift are often difficult to detect under general anaesthesia. However, tachycardia, hypotension, narrowed pulse pressure and arterial desaturation should raise the suspicion especially when airway pressures are raised. With small pneumothorax, clinical signs are minimal and chest radiograph or ultrasongraphy may be inconclusive. CT scan can differentiate pneumothorax from bullous lung disease. In some cases, HRCT of the thorax may be needed for the correct diagnosis.

Management : Small pneumothorax in a spontaneously breathing patient without significant

breathlessness and hemodynamic instability can be observed for spontaneous resolution. As nitrous oxide diffuses into air, it should be immediately stopped and high concentration of oxygen has to be given which can speed up the resolution of the pneumothorax by reducing the partial pressure of nitrogen in the pulmonary capillaries increasing the absorption of air from the pleural cavity.

In those with minimal signs, aspiration can be tried using a cannula inserted into the pleural cavity in the fourth inter-costal space. If aspiration is unsuccessful or in symptomatic patients, intercostals drainage tube should be inserted and connected to underwater seal and retained until bubbling of air has ceased. Follow up with chest radiography is needed for confirmation of the position of the tube and for lung re-inflation before removal of the ICD.

Conclusion

Critical incidents often occur in anaesthetic practice in un-anticipated situations, which can be devastating and life threatening. Pneumothorax is one among them, in which early diagnosis and prompt management can often save the life of the patient.

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24	International Journal of History	2	6500	6000	650	600
25	International Journal of Neurology and Neurosurgery	2	10000	9500	1000	950
26	International Journal of Political Science	2	5500	5000	550	500
27	International Journal of Practical Nursing	3	5000	4500	500	450
28	International Physiology	2	7000	6500	700	650
29	Journal of Animal Feed Science and Technology	2	4100	3600	410	360
30	Journal of Cardiovascular Medicine and Surgery	2	10000	8600	910	860
31	Journal of Forensic Chemistry and Toxicology	2	9000	8500	900	850
32	Journal of Microbiology and Related Research	2	8000	7500	800	750
33	Journal of Orthopaedic Education	2	5000	4500	500	450
34	Journal of Pharmaceutical and Medicinal Chemistry	2	16000	15500	1600	1550
36	Journal of Social Welfare and Management	3	7500	7000	750	700
37	Meat Science International	2	5000	4500	500	450
38	New Indian Journal of Surgery	3	7500	6600	710	660
39	Ophthalmology and Allied Sciences	2	5500	5000	550	500
40	Otolaryngology International	2	5000	4500	500	450
41	Pediatric Education and Research	3	7000	6500	700	650
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Case Report

Received on 01.08.2016, **Accepted on** 10.08.2016

Indian Journal of Anaesthesia and Analgesia
Volume 3 Number 3, September - December 2016
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.3316.11

Spinal Anaesthesia in Kyphoscoliosis

Rajesh Kumar Verma*, Alpana Kaistha, Kartik Syal*, Ramesh Kumar*****

Abstract

The patients with spine abnormalities, present unique challenges to the health care provider responsible for administrating sedation and anaesthesia during surgical and technical procedures. Spinal deformities may cause difficulties with both tracheal intubation and regional anaesthesia. This report describes the anaesthetic management for orthopaedic procedure that were performed in a patient with severe thoracolumbar kyphoscoliosis. After examining the risk factors, spinal block by injecting single dose hyperbaric local anaesthetic solution to intrathecal space was chosen to provide anaesthesia. Interathecal hyperbaric bupivacaine 0.5% 10mg (2ml) was used, motor and sensory blockade T10 was achieved. The patient reported satisfactory anaesthesia and developed no complications. In conclusion, spinal anaesthesia can be successful even in case of thoracolumbar kyphoscoliosis.

Keywords: Kyphoscoliosis; Spinal Anaesthesia.

Case Report

A 75-year-old male, with S shaped curvature of spine-kyphoscoliosis was scheduled for surgery, open reduction and internal fixation for fracture tibia right lower limb. He was chronic smoker for last 50 years and he smoked 15 biddies per day. He had history of shortness of breath grade 1(MMRC). He had hypertension for last 10 years and on medication.

His neck movements, including extension were limited. The patient was alert and co-operative. His airway was assessed as Mallampati class III (difficult oro-tracheal intubation is to be expected in class III and class IV). The thyro-mental distance was 5cm (predictor of difficult oro-tracheal intubation). The physical examination of patient has murmur in cardiovascular system and lung capacity was limited.

The routine investigations of patient were normal. Echocardiogram suggestive of mild tricuspid regurgitation but left ventricular ejection fraction was normal. The pulmonary function tests were suggestive of severe restriction.

The spinal anaesthesia was considered as best option for this patient. The patient was informed about what was involved in this type of anaesthesia and informed consent was taken from the patient. The preparations were made for airway, circulatory, ventilatory support, in the event of high spinal anaesthesia. Oxygen was administered by face mask and patient was continuously monitored with electrocardiography, pulse oximetry and non- invasive blood pressure assessments.

Spinal anaesthesia was given in sitting position. After local anaesthetic infiltration, a 26-gauge Quincke spinal needle was inserted in L3-4 interspace in midline. After third attempt, we were able to do the lumbar puncture. The free flow of cerebrospinal fluid was observed and confirmed. The drug was administered, 10 mg of 0.5% hyperbaric bupivacaine which is a local anaesthetic. Hyperbaric solution of local anaesthetic is of high density as compared to cerebrospinal fluid. The patient was turned to supine position. The block was adequate with pin prick testing, sensory block up to T-10 and adequate motor blockade was achieved. The patient remained comfortable and hemodynamically stable throughout the forty-five minute procedure, which was uneventful. Post operatively, after 180 minutes of intrathecal injection, sensory and motor functions were completely restored. After five days, patient was discharged from hospital with no complications.

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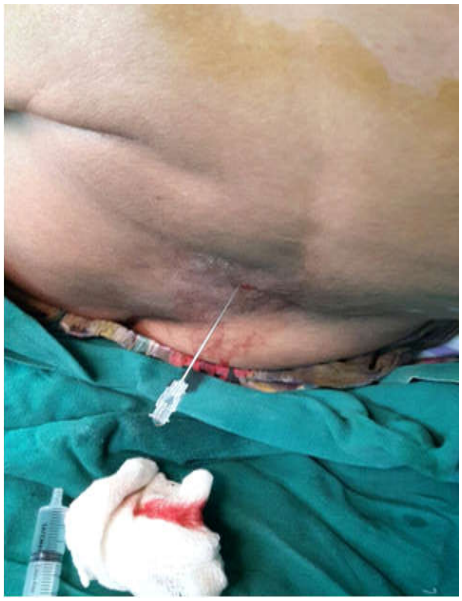

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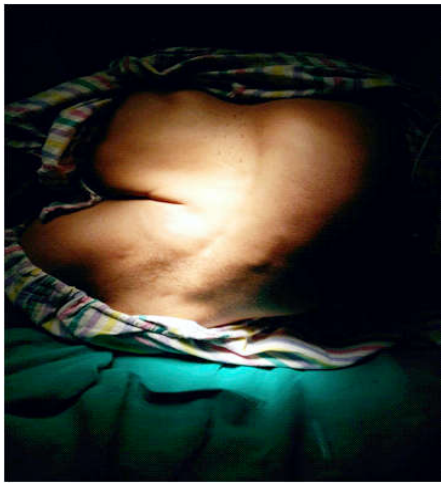

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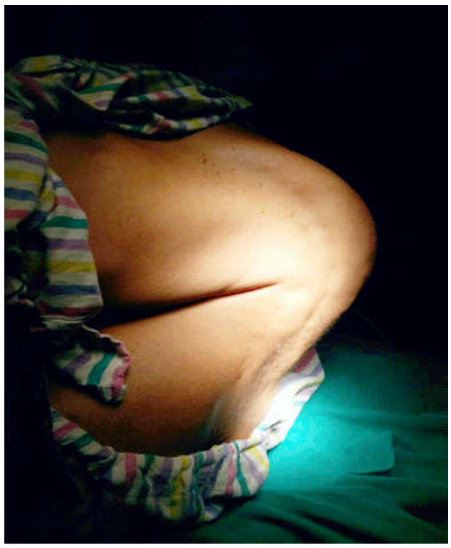

Fig. 3:

Discussion

Kyphoscoliosis is abnormal curvature of the spine both in coronal and saggital plane. It is a combination of kyphosis and scoliosis. This musculoskeletal disorder often leads to other issues in patients such as under-ventilation of lungs, pulmonary hypertension and difficulty in performing day-to-day activities. Kyphosis refers to an excessive convex curvature of spine in the thoracic and sacral regions. The normal thoracic curvature is convex shape and angles 20 abnormal curvature spine S or C shape.

The various kyphoscoliosis challenges are in respiratory and cardiovascular system as well as in musculoskeletal system. The various pulmonary issues include functional changes as well as decrease in total lung capacity, decrease in vital capacity and functional residual capacity. The cardiac changes may be associated with increase in pulmonary vascular resistance and pulmonary hypertension. It may result in right ventricular hypertension and right ventricular failure. It is because of hypoxemia leading to pulmonary vasoconstriction which lead to increase in pulmonary vascular resistance finally increases pulmonary artery pressure. The main handicap of general anaesthesia is that ideal position for laryngoscopy and intubation may not be possible. The level and degree of deformity in general anaesthesia can lead to relaxation of the pharyngeal elements. The pre-existing airway obstruction can increases chances of post-operative complications.

Regional anesthesia can be given and case reports of successful spinal anesthesia in patients with severe kyphoscoliosis had been reported. The main handicap of regional anaesthesia are decreased success rate due to unsuccessful insertion, multiple attempts, false loss of resistance, dural puncture, failed or inadequate block. Viewing the anteroposterior and lateral X-rays or USG prior to attempting block can overcome some of the technical difficulties by identifying the level and approach. Severe kyphoscoliosis can be associated with decreased volume of cerebrospinal fluid and with hypobaric solution or rapid injection, a higher than expected level can occur. So we used hyperbaric solution for intrathecal injection.

Spinal anesthesia is less reliable in kyphoscoliosis but successful outcomes have been described(Moran and Johnson 1990; Douglas 1995; Dresner and Maclean 1995; Hatzakorizan et al. 2001, Gurayten Ozyurt et al. 2005). In one case of a patient with severe kyphoscoliosis, an attempt at continuous spinal anesthesia with hyperbaric bupivacaine was

unsuccessful, and adequate surgical anesthesia was only achieved by adding isobaric bupivacaine solution (Moran and Johnson 1990). Douglas (1995) described an asymmetric block in a patient with marked scoliosis; the patient had incomplete block on left, but satisfactory spinal block was obtained with hyperbaric bupivacaine after table was tilted to left. In 2005 Gurayten Ozyurt successfully reported spinal anesthesia in patient with severe thoracolumbar kyphoscoliosis for urological surgeries.

In our case, we preferred regional anesthesia over general anesthesia, as patient was elderly with hypertension, chronic smoker. It was anticipated difficult intubation as patient Mallampati score was III and thyromental distance was 5cm. Moreover patient was having restrictive pulmonary functions and mild tricuspid regurgitation. So we decided to give spinal anesthesia in our patient and we achieved symmetrical sensory and motor blockade with injection of hyperbaric bupivacaine. This case demonstrates that spinal anesthesia can be successful even in cases of severe thoracolumbar kyphoscoliosis. Interathecal injection of hyperbaric solution can produce symmetrical and adequate motor and sensory blockade in patients with extreme spinal deformities or musculoskeletal conditions affecting spinal column.

Conclusion

Regional anesthesia can be given in patients with severe kyphoscoliosis ,even chances of partial effect and asymmetrical blockade are there due to curvature of spine.

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