Original Article

Indian Journal of Anaesthesia and Analgesia
Volume 4 Number 1, January - March 2017
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.4117.10

Study on the Incidence of Perioperative Arrhythmias in Lower Segment Caesarean Section Patients Under Spinal Anaesthesia

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Abstract

Background: Lower segment caesarean sections [LSCS] are the most common emergency or elective cases we come across. Majority of these cases are done under regional anaesthesia. Perioperative cardiac arrhythmias in these cases are common because of the altered physiology of pregnancy and anaesthesia. Significantly most of these arrhythmias are benign. However, some arrhythmias during spinal anaesthesia can cause sudden vascular collapse and lead to increased peri-partum morbidity and mortality. There are few case reports reported but the incidence of intraoperative arrhythmias is not well established. So this study on the incidence of arrhythmias during spinal anaesthesia in LSCS patients was undertaken.

Methodology: We conducted this prospective study for a period of one year between august 2014 to august 2015. 957 patients underwent LSCS under spinal anaesthesia in this one year period. Out of which 68 patients were excluded as they had non-pregnancy related complications. 158 patients with pregnancy related complications like eclampsia, pre-eclampsia, gestational DM and gestational HT were also excluded. 10 cases got excluded as they had inadequate block so converted to GA. The study group included 721 patients.

Results: 101 patients i,e 14% of them out of 721 patients developed arrhythmias peri-operatively. Bradycardia was seen in 39[5.40%] patients followed by ventricular ectopics in 30 [4.16%] patients.

Conclusion: Arrhythmias under anaesthesia are quite common. Most of these perioperative arrhythmias revert back spontaneously. Only few of them needs treatment and most of them have stable haemodynamics. The surgeons should be gentler and the anesthesiologists should be vigilant. Continuous, close monitoring of the patient is mandatory.

Keywords: Lower Segment Caesarean Sections [LSCS]; Perioperative Arrhythmias; Spinal Anaesthesia.

Introduction

Arrhythmias under anaesthesia are frequently encountered by anaesthesiologist's. However life-threatening arrhythmias are not so common. Adversecardiovascular events can occur during arrhythmias. Although the incidence is higher during cardiac surgery and in cardiac patients, intra-operative dysrhythmias do occur innon-cardiac patients undergoing non-cardiac surgery. The incidence is higher in general anaesthesia compared to spinal anaesthesia. Relatively minor fluctuations in haemodynamic parameters due to arrhythmias cannot have significant long-term co-morbidity. However major intra-operative dysrhythmias can cause sudden cardiovascular collapse altering the perfusion of vital organs like brain, heart and kidneys [1].

The incidence of perioperative arrhythmias are not well established during LSCS [Lower segment caesarean sections].A wide range of cardiac arrhythmias can be observed during perioperative period and they usually have multifactorial origin. A large number of these perioperative arrhythmias have stable haemodynamics and can be successfully managed. Most common causes of these perioperative arrhythmias are electrolyte imbalance, hypercapnia, hypoxia, hypothermia and hypotension [1].

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Received on 12.12.2016
Accepted on 28.12.2016

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Methodology

This prospective study was conducted in the Department of Anaesthesiology; MVJ MC & RHfor a period of one year between august 2014 to august 2015. The hospital ethical committee approval for the study protocol was obtained.Written informed consent was obtained from all the patients who were enrolled for the study. Pre anaesthetic check-up was carried out as and when required with a detailed history, general examination and systemic examination, airway assessment, spinal column examination. The following laboratory tests were done - Hemoglobin, Urine analysis, Blood sugar, Blood grouping and Rh typing. Both emergency and elective LSCS patients of ASA I and IIwho received spinal anaesthesia were included in the study. Patients with previous history of arrhythmias, epilepsy, asthma, hypertension, diabetes mellitus, thyroid dysfunction, with valvular heart disease and other cardiac diseases were excluded from the study. Failed spinal or due to other reason if patient was given general anaesthesia they were also excluded from the study. Patients with pregnancy related complications like eclampsia, pre-eclampsia, gestational hypertension and gestational diabetes mellitus were also excluded from the study group.

Inside the OT IV line was secured with 18g cannula. Basal recording of pulse, ECG, blood pressure and SpO2 were recorded. After preloading with 500 mL of lactated Ringer's solution, spinal anaesthesia was administered using a 25-G Quincke spinal needle between L3- 4 intervertebral space under all aseptic precautions. 2 mL of 0.5% hyperbaric bupivacaine was injected intrathecally in lateral position after confirming free CSF flow. Oxygen was administered at 4 L/min through a simple face mask during perioperative period. Right lateral wedge was given to all patients. Intraoperative monitoring included 5 leads electrocardiography [ECG] -lead II, pulse oximetry [SpO2], noninvasive blood pressure[NIBP]. Rhythm and rate were monitored and any deviation from normalwas considered as arrhythmia. ECG was closely monitored and whenever arrhythmias occurred, the ECG was recorded. After baby extraction all patients received 5 units of oxytocin in each bottle of intravenous fluids. Ergometrine when required was given as intramuscular injection. Prostodin (15-methyl PG F2-alpha) acts as a smooth muscle stimulant and is a recognized second-line agent for use in the management of postpartum uterine atony unresponsive to oxytocin/ergometrine was given asintramuscular injection whenever required. Hypotension was defined as mean arterial pressure less than 20% of the baseline reading. Ephedrine 6 mg and crystalloids were administered intravenously whenever hypotension occurred. Atropine 0.6 mg was administered intravenously when heart rate went below 50/min. Xylocard 1mg/kg was given when the rate went above 160/min. Carotid massage on one side was also done for tachycardia more than 160/min. The results are shown as mean (±SD) and proportions are expressed as a percentage.

Results

957 patients underwent LSCS under spinal anaesthesia in this one year period between august 2014 to august 2015. Out of which 68 patients were excluded as they had non-pregnancy related complications. 158 patients with pregnancy related complications like eclampsia, pre-eclampsia, gestational DM and gestational HT were also excluded. 10 cases got excluded as they had inadequate block so converted to GA. The study group included 721 patients. 101 patients i,e 14% of them developed arrhythmias in the peri-operative period. Bradycardia was recorded in 39[5.40%] patients and

Table 1: Characteristics of patients

	Age (yrs)	Height (cm)	Weight (kg)
Mean ± SD	26.5±5.4	153.03±5.08	56.3±6.7
Range	18--29	140--162	45--82

Table 2: Perioperative incidence of arrhythmias

	Number of pt	Percentage
Bradycardia	39	5.40%
A-V blocks	9	1.24%
SVT	15	2.08%
Atrial ectopic	6	0.83%
Ventricular ectopic	30	4.16%
AF	2	0.27%
Total	101	14%

A-V-atrioventricular, SVT-supra ventricular tachycardia, AF-atrial fibrillation

Table 3: Patients receiving ergometrine and prostodin

	Number of pt	Percentage
ergometrine	272	37.72%
prostodin	196	27.18%

ventricular ectopics in 30[4.16%] patients. Supra ventricular tachycardia in 15 [2.08%] patients, atrioventricularblocks in 9 [1.24%], Atrial ectopic in 6 [0.83%] and atrial fibrillation in 2 [0.27%] patients were recorded.

Discussion

Spinal anaesthesia has been considered as safest regionalanesthesia technique for LSCS. Arrhythmias during spinal anesthesia i,e the incidence of peri-operative arrhythmias is not well established. There are very few case reports and the studies are almost not there in the literature. In this prospective study the incidence of arrhythmias during spinal anesthesia in LSCS patients was done.The incidence of arrhythmias during spinal anesthesia for Cesarean section was 14%,101 cases in our study. Most of them wereBradycardia and Ventricularectopics, followed by supra ventricular tachycardia. Although these arrhythmias were transient and recovered spontaneously few of them needed medication and they responded to the treatment. Out of these 39 patients developed bradycardia, out of which 20 were during baby extraction when uterus was pressed from above, which reverted back immediately without any treatment. 9 cases immediately after spinal anaesthesia when the patient was turned supine which was treated with inj atropine. 6 cases developed bradycardia when they were doing tubectomy, we treated only 3 cases other 3 reverted without treatment. 2 cases when they externalised the uterus for massaging, needed inj atropine and the other 2 cases developed when injProstodin was given which reverted back without treatment. Ventricular ectopics were seen in 30 patients out of whom 22 patients developed it when uterus was externalised for suturing as most of them were stable hemodynamically and less than 6 per minute we did not treat them. 3 cases were associated with bradycardia during tubectomy which was treated with atropine. 5 cases were during manual placental extraction. Supra ventricular tachycardia in 15 patients, 10 cases were after injmethergin and 5 cases after inj atropine. Atrioventricular block in 9 patients was associated with bradycardia, one case of ventricular ectopic and one case of A-V-atrioventricular block continued inspite of medication. These two cases were referred to cardiologists for further management. Most of our patients remained hemodynamically stable.All the possible causes of the perioperative cardiac arrhythmias under anaesthesia like hypoxia, hypercarbia, electrolyte abnormality acid-base imbalance, stress, and pain have been ruled out in our cases. All patients were given oxygen by mask and the blood pressure was maintained with in the normal range. Fluctuations in cardiac output, extraction of baby, placental expulsion andmedications may be the major cause of arrhythmias in over patients.

Spinal anaesthesia causes sympathetic block leading to decreased sympathetic outflow [2,4]. This causes peripheral vasodilation andfall in blood pressure. This leads to decrease in the cardiac output. If patient develops bradycardia at this stage there will be further fall in the cardiac output leading to ischemia. This needs immediate and prompt treatment. These patients will develop metabolic acidosis and electrolyte imbalances which can precipitate arrhythmias, further leading to hemodynamic instability and cardiac arrest. Surgical stimulation like handling the ovaries, peritoneal traction, massaging the uterus, giving traction to the umbilical cord to bring out the placenta and dilating the cervix can lead to perioperative arrhythmias [3,4]. A large number of these intraoperative arrhythmias can be successfully managed by observation and elimination of the implicated stimuli mentioned above.

Oxytocin bolus causes tachycardia and hypotension [5,6]. Peripheral vasodilatation and reduced myocardial filling time decreases the cardiac output causes hypotension.Tachycardia can have detrimental effects in these patients as they develop ischemia due to reduced coronary diastolic filling time increased workload and hypotension. Ergometrine [7] causes coronary vasoconstriction and hypertension and increases the risks of myocardial ischemia and pulmonary oedema.Side effects of Prostodin[PG F2-alpha] are related to its effects on smooth muscles. They include nausea, vomiting, diarrhoea, bronchospasm, and systemic hypertension. Anaesthesiologist should be vigilant during administering these drugs as potentially dangerous arrhythmias can develop.

In pregnancy heart rate increases by 25%, thus sinus tachycardia, more during the third trimester, is quite common. Ectopic beats and non sustained arrhythmia were encountered in more than 50% of pregnant women investigated for palpitations [8]. Perioperative cardiac arrhythmias are relatively

frequent in both normal adults and pregnant women. The possible precipitating factors are hypoxia, hypercapnia, myocardial infarction, catecholamines, electrolyte abnormalities, acid-base imbalance, drug toxicity and adverse drug reactions. The sudden appearance of any new arrhythmia, regardless of hemodynamic consequences, is of concern and warrants attention. But compared to normal adult during pregnancy there are some physiological changes which increases the chances of perioperative cardiac arrhythmias during normal pregnancy. These physiological changes which occur during pregnancy, during anesthesia can further increase the incidence of arrhythmias in these patients. Fifty per cent increase in intravascular volume with its peaks at third trimester, Progressive decrease in systemic vascular resistance. 30-40% increase in cardiac output, 15% increase in heart rate, beginning at 8 weeks of gestation and peaking at approximately 34 weeks.Cardiac output is increased as well, with an average of 6.7 L/min in the first trimester and ≤8.7 L/min in the third trimester. This is the result of a 35% increase in stroke volume and a 15% increase in heart rate. The increase in plasma volume causes stretching of atrial and ventricular myocytes, and this may result in early after depolarizations, shortened refractoriness, slowed conduction, and spatial dispersion through activation of stretch-activated ion channels.Several hypothetical mechanisms have been invoked to explain the increased propensity for arrhythmias during the pregnancy. These include hemodynamic, autonomic, hormonal, and emotional changes related to pregnancy leading to increased plasma catecholamine concentrations and adrenergic receptor sensitivity, atrial stretch, and end diastolic volumes due to intravascular volume expansion [8]. Progesterone can cause selective cardiac depressant effect. Estrogen may alter the actomyocin-ATPase relationships in the myocardium and increase myocardium contractility. Although there are no relevant studies on the effect of sex hormones on the cardiac tissue, however, studies say that estrogens increase the number of β-adrenergic receptors in the myocardium and the α-adrenergic receptors in platelets [10,11]. Lower segment caesarean sections [LSCS] patients with altered physiology because of pregnancy are more prone during anaesthesia. If not recognised and treated timely they are at high risk in post-operative period for further complications like stroke, myocardial infarction, congestive cardiac failure, severe ventricular dysrhythmias, renal failure and cardiac arrest [1,6,10].

The resting ECG of a pregnant woman will be slightly different to that of a non pregnant woman.The increase in heart rate can lead to decreased PR, QRS and QT intervals. The electrical axis can be shift to the left because of the gravid uterus, and ectopics (premature atrial/ventricular beats) are quite common during pregnancy. There may be a Q wave and inverted T wave in the inferior leads.4 to 14 percent of women develop nonspecific ST segment and T-wave changes which typically resolve after delivery.The incidence of APBs and VPBs was found to be 56 and 59 percent, respectively. During labor, APBs and VPBs were detected in 90 and 50 percent of women, respectively. Stretch of the chambers particularly the left atrium produces cardiac conduction abnormalities. Supraventricular tachycardias and ventricular extrasystoles are common during pregnency,while many arrhythmias which occur during pregnancy are benign and self-limited [12].

Somboonviboon W [13]et al conducted a prospective cross sectional study from November 1, 2004 to July 31, 2005 on 722 parturients undergoing caesarean section under spinal anaesthesia.The current study evaluated factors associated to the incidences of hypotension or bradycardia.Incidence of hypotension and bradycardia were 52.6% and 2.5%. There results indicated that the incidence of hypotension after spinal anesthesia for cesarean section increased with amount of estimated blood loss > 500 mL and analgesic level > T4. Adding intrathecal morphine 0.2 mg (0.2 mL) to local anesthetics increased incidence of bradycardia.

Shen CL [14], et al studied 254 healthy women undergoing Cesarean section under spinal anesthesia prospectively. There results showed first degree atrioventricular block in nine patients (3.5%), second degree atrioventricular block in nine (3.5%), severe bradycardia(heart rate < 50 beats/min) in seventeen (6.7%), multiple VPC in three (1.2%) patients. The height and weight of patients with severe bradycardia, multiple VPCs, or atrioventricular block were not different from those of the other patients. However, the age of patients in the potentially dangerous arrhythmias group was greater than that in the other group (P = 0.006). They concluded that the incidence of arrhythmias as well as hypotension during spinal anesthesia for Cesarean section was higher than expected. Although most of these arrhythmias were transient and recovered spontaneously, they might unexpectedly occur and sometimes need immediate and prompt treatment.

Lewis NL [15] et al in the UK registry of high risk obstetric anaesthesia: arythmias, cardio-myopathy,

aortic stenosis, transposition of great arteries and marfan's syndrome reported as follows. In UK registry of high-risk obstetric anaesthesia which was set up in late 1996 to collect reports of high-risk pregnancy. They pooledthem into a central database. At the time of analysis for this paper i,e December 31, 2001, 308 cardiorespiratory reports were received. The five most common conditions, occurring in 125 cases (41% of the total), were arrhythmias (43 cases), cardiomyopathy (26 cases), aortic stenosis (24 cases), transposition of the great arteries (18 cases) and Marfan's syndrome (14 cases).

A wide range of cardiac arrhythmias can be observed in perioperative period. A large number of these perioperative arrhythmias revert back spontaneously. Most of them have stable haemodynamics and can be successfully managed. Administering oxytocic drugs should be in infusion as stat can causepotentially dangerous arrhythmias. The probable causes of these perioperative arrhythmias are acute blood lose, hypotention, bradycardia and tachycardia.Surgical causes like handling the ovaries, pushing hardly the abdomen during baby extraction, externalizing the uterus, massaging the uterus, giving traction to the umbilical cord to take out the placenta and dilating the cervix can also lead to perioperative arrhythmias. Most of them can be avoided, the surgeons should be gentler and the anesthesiologists should be more vigilant. Due to reduced cardiopulmonary reserve in pregnancy perioperative arrhythmias can lead to major cardiovascular complications.

Conclusion

In the current study, we analyzed the incidence of perioperative incidence of arrythmias during cesarean under spinal anesthesia. Spinal anaesthesia is an excellent regional technique which provides good operating conditions for caesarean section. Anesthesiologists caring pregnant women must remember that perioperative arrhythmias may occur without any warning signal and timely intervention is the only key for maternal safety. Continuous, close monitoring of the patient is mandatory.

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