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Egyptian Journal of Anaesthesia

journal homepage: www.elsevier.com/locate/egja

Research article

Cross-sectional study about perioperative management of Blood Pressure and effects of anaesthesia in hypertensive patients undergoing general & orthopaedic surgery

Paresh Girdharlal Koli^{a,*}, Yashashri Shetty^a, Sweta Salgaonkar^b, Minakshi Dongre^a, Sankalp Arora^c

^a Dept. of Pharmacology & Therapeutics, Seth GS Medical College & KEM Hospital, Parel, Mumbai 400012, India

^b Dept. of Anaesthesiology, Seth GS Medical College & KEM Hospital, Parel, Mumbai 400012, India

^c Seth GS Medical College & KEM Hospital, Parel, Mumbai 400012, India

ARTICLE INFO

Keywords:

General surgery
Orthopaedics
Hemodynamics

ABSTRACT

Introduction: Hypertension is regarded as an additional risk factor during anaesthesia. There is not enough Indian evidence in literature regarding antihypertensive usage and its implications during perioperative period in patients undergoing general & orthopedic surgery. This drove us to conduct this study.

Methods: Single centre cross-sectional observational study conducted in a General Surgery and Orthopaedics wards of a Tertiary care hospital. The data was collected from the period of first visit by the anaesthetist to 24 h' postoperative period of the operated hypertensive patients. The variables accounted were of antihypertensive medications, anaesthesia drugs, hemodynamics, blood loss and fluids used. The data was analysed by using descriptive statistics, nonparametric tests and $P < 0.05$ was considered as significant.

Results: 180 patients had median age of 65 years (Interquartile range – 20). Calcium channel Blockers were the most common class and Amlodipine was most common antihypertensive medication used during perioperative period. 132 patients took antihypertensive medication on the morning of the surgery. In 136 patients' antihypertensive medication was started within 24 h' postoperative period. Bupivacaine was most common anaesthetic drug used. Intraoperative fall in SBP (Systolic Blood Pressure) was found in 31 patients, and rises were found in 7 patients. Also, intraoperative fall in DBP (Diastolic Blood Pressure) was found in 13 patients, and rises were found in 9 patients. Intraoperative hemodynamic changes were managed appropriately by the anaesthetist. The median IV fluids given intraoperatively was 1375 ml (Interquartile range – 700). Median blood loss was 272 ml (Interquartile range – 250).

Conclusion: Antihypertensive medications use during perioperative period were not associated with major hemodynamic changes.

1. Introduction

Hypertension is the most common condition seen in primary care, and it remains one of the most important preventable contributors to disease and death [1]. Withdrawal of antihypertensive drugs could lead to withdrawal symptoms like rebound hypertension, tachyarrhythmia, nervousness, anxiety, and exaggeration of angina and occasionally myocardial infarction and sudden death [2].

A hypertensive patient can undergo routine stressors like infection, trauma & surgery. During surgery, the manipulation of blood pressure (BP) is crucial for the conduct of the surgery as well as to prevent

complications of surgery. Hypertension is regarded as an additional risk in anaesthesia [3]. There are different theories regarding the use of antihypertensive, whether to continue the same anti-hypertensives prior to surgery or discontinue and start on different anti-hypertensives. One of the recommendation is that if the diastolic blood pressure (DBP) is ≤ 110 mmHg and stable, surgery may proceed without delay provided the perioperative blood pressure is monitored closely, and hyper- or hypotensive episodes are treated appropriately [4]. Another approach is if the DBP is > 100 mmHg, with or without antihypertensive therapy, surgery should be deferred until the blood pressure is under better control [5].

Peer review under responsibility of Egyptian Society of Anesthesiologists.

* Corresponding author.

E-mail address: prshkoli@gmail.com (P.G. Koli).

<https://doi.org/10.1016/j.egja.2018.05.002>

Received 20 September 2017; Received in revised form 9 May 2018; Accepted 20 May 2018

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Thus, there are no guidelines as to how these antihypertensive medications should be manipulated before, during or after the surgery. Further, there are no head on comparison studies between all classes of antihypertensive medications usage during perioperative period specially in patients undergoing general & orthopaedic surgery. Also, there are no studies on Indian population who are given antihypertensive medications like beta blockers even though JNC 8 guidelines (Joint National Committee 8 guidelines) no longer recommend use of beta blockers.

Therefore, we planned an observational study, to evaluate how a hypertensive patient when undergoes surgery is managed in terms of the antihypertensive drug usage, complications and adverse events handled.

2. Methods

The study was a single centre cross-sectional observational study conducted in a tertiary care hospital for 9 months. The study began after approval from Institutional Ethics Committee. Patients admitted to General surgery and Orthopaedics wards for elective surgery consented for the study after considering the selection criteria. Inclusion criteria were patients with age of 18 years to 75 years of either gender, admitted to general surgery and orthopaedics wards. Patients who were hypertensive whether taking or not taking any antihypertensive medications and had undergone elective general & orthopaedic surgery during the duration of the study period. Exclusion criteria were patients with pheochromocytoma, pregnant women, complicated patients and emergency surgeries.

Patients files were evaluated to get the details of history of hypertension, time between the first visit of the patient to the anaesthetist and anaesthesia fitness clearance, time to control of uncontrolled hypertension, any delay or postponement of surgery due to uncontrolled hypertension, and BP recording on first visit to the anaesthetist. Similarly, modifications in anti-hypertensive treatment during the scheduled surgery and anti-hypertensive medications continued on the day of the surgery were noted. Patient notes on day of the surgery by anaesthetists and surgeon were evaluated to find anaesthesia risk (The American Society of Anesthesiologists (ASA) grades), type of surgery, whether antihypertensive drugs stopped before surgery or continued, pre-anesthetic medications started, type of anaesthesia, intraoperative hemodynamics, total blood loss, duration of anaesthesia and any perioperative adverse events and their management. The patients' files were analysed to find postoperative adverse events and its management along with the duration after which antihypertensive medications were started again. Data was collected for 24 h' in postoperative period.

Intraoperative hemodynamics included SBP, DBP & HR (Heart Rate). A total number of falls (drops) and ups (rises) in SBP & DBP were noted. Falls were defined as drop of BP 30% below the baseline value (BP at the start of surgery) and ups were defined as BP 10% above baseline value. ECG (electrocardiogram) changes were recorded as either intraoperative ECG changes were present or absent and if present whether it required any intervention.

Data collection included data from patient's first visit to anaesthetist to 24 h' postoperative period in the case record form. The study finding was recorded in a single visit after 24 h of surgery in the respective wards.

Sample size was based on duration of the study. At the end of data collection, complete data from all the case record forms were entered in a Master-chart in MS-EXCEL format for analysis. Statistics were applied using IBM SPSS statistics software version 23 and $P < 0.05$ was considered as significant.

3. Results

A total of 180 hypertensive patients' data in perioperative period was collected in the study. Normality was tested with Shapiro-Wilk test.

All the variables were not normally distributed except SBP at the end of anaesthesia.

The median age of the patients was 65 years (Interquartile range – 20). Minimum age of the patient recruited was 25 years, and maximum age was 75 years. 80 patients were male, and 100 were female. The median duration of hypertension was 60 months (Interquartile range - 96) with a minimum duration of hypertension in a patient being 10 days and maximum duration of 360 months. In three patient's durations of hypertension was unknown and 8 patients were newly diagnosed hypertensives.

Out of 180 patients, 13 patients (7.2%) were not taking any anti-hypertensive medications at the time of admission and in 4 patients the history of taking anti-hypertensive medication was not known. Amlodipine was the most commonly taken antihypertensive medication by 104 patients. Other common antihypertensive medications were Telmisartan ($n = 34$), atenolol ($n = 21$), metoprolol ($n = 19$), losartan ($n = 14$), hydrochlorothiazide ($n = 14$) and others ($n = 42$). Classes of antihypertensive medications used were CCB (Calcium Channel Blocker) in 110 patients, ARB (Angiotensin Receptor Blocker) in 52 patients, BB (Beta Blockers) in 41 patients, Diuretics in 23 patients, ACEIs (Angiotensin Converting Enzyme Inhibitors) in 17 patients, alpha blockers (AB) in 4 and vasodilators in one patient. Most commonly prescribed combination of Antihypertensive medications was CCB + BB ($n = 21$), CCB + ARB ($n = 18$), ARB + Diuretics ($n = 9$) and CCB + ACE inhibitors ($n = 3$). 77 patients had been taking combination of antihypertensive drugs, and 84 patients were taking a single antihypertensive drug.

A total of 94 patients had 115 co-morbidities. Most common co-morbidity found was Diabetes mellitus ($n = 41$). A combination of Spinal and Epidural was the most common method of anaesthesia ($n = 58$), spinal only was in 57 patients, GA only was in 39 patients, regional anaesthesia was in 14 patients, spinal + regional in 4 patients, Epidural and GA + Epidural was in 3 patients each and spinal + local anaesthesia and GA + regional was given in 2 patients each.

SBP at the 1st visit by the patients to the anaesthetist was 133.58 ± 14.35 and DBP was 83.03 ± 9 . Median time to anaesthesia fitness for surgery was 4 days (Interquartile range – 6.75). 35 patients got fitness on the 1st visit to the anaesthetist. Median duration taken to control the uncontrolled hypertension was 2 days (Interquartile range – 1) and 1 patient had uncontrolled hypertension until the day of surgery. In 13 cases, there was a delay in anaesthesia fitness due to uncontrolled hypertension for reasons as ECG changes, left ventricular failure, uncontrolled hypertension, awaiting physician and cardiology opinion.

In 2 patients antihypertensive medication taken by the patient was modified by the anaesthetist/ physician. In one case Ramipril taken by the patient was stopped 4 days before surgery, and in another case, atenolol was stopped & amlodipine was continued by the anaesthetist. In 11 patients, new antihypertensive medications were started. In 8 cases Amlodipine 5 mg OD (once daily), in 1 patient Amlodipine 10 mg BD (twice daily), in 1 patient Amlodipine 5 mg OD & Losartan 25 mg OD and in 1 patient Losartan 50 mg SOS was started.

In 132 patients antihypertensive medications were continued till the morning of surgery and in 48 patients no antihypertensive drug was continued. Most common classes of drugs continued till morning of surgery were CCB continued in 98 patients, ARB in 26 patients, BB in 26 patients, Diuretics in 11 patients, ACE inhibitors in 9 patients, AB in 2 and Vasodilators in none.

ASA class for patients undergoing anaesthesia were, ASA 2 ($n = 153$), ASA 3 ($n = 24$) and ASA 4 ($n = 3$). Most common type of surgeries was fracture reduction ($n = 69$), hemiarthroplasty ($n = 23$), TKR – Total Knee Replacement ($n = 20$), THR – Total Hip Replacement ($n = 19$), Spacer ($n = 7$), decompression Fixation ($n = 5$) and closed Reduction ($n = 4$).

A combination of Spinal and Epidural (neuraxial anaesthesia) was the most common method of anaesthesia ($n = 58$).

Most commonly used anaesthesia drug was bupivacaine in 137

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