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Evaluation of vas score in patients undergoing surgery diagnosed with hypertension undergoing the general and regional anesthesia

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Abstract
Cardiovascular stability is important during anaesthesia and the perioperative period. Hypertensive patients are at risk of greater swings of blood pressure than the normal population and it has been shown that blood pressure lability can be associated with increased cardiovascular morbidity and mortality postoperatively, particularly in patients with severe uncontrolled hypertension. Optimisation of such patients with investigation and drug treatment can improve long term outcome and prevent such complications. Patients who have hypertension require a higher blood pressure for adequate organ perfusion than normotensive patients – this is particularly in the elderly. Avoidance of hypotension (and apparent normotension in patients who normally rely on higher values in everyday life), may prevent complications of under perfusion. Hence based on above findings the present study was planned for Evaluation of VAS Score in Patients Undergoing Surgery Diagnosed with Hypertension Undergoing the General and Regional Anesthesia.
The present study was planned in Department of Anesthesia and Critical Care, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. The study was conducted from the duration of March 2019 to October 2019. Total 30 cases of the hypertensive patients undergoing surgery by General and regional anaesthesia were enrolled in the present study. The 15 cases were enrolled in the Group A as patients undergoing the General Anesthesia. The remaining 15 cases were enrolled in Group B as Regional anesthetic cases. The post-operative VAS pain score among the patients of both the groups were retrieved for the study.
The increased intra-operative fluctuations and reduced post-operative pain among the patients in the regional anaesthesia group in comparison to those under general anaesthesia group. Hypertension is a modifiable risk factor for cardiovascular diseases and outcomes, and the same is true of the patient presenting for surgery.

Keywords: general anaesthesia, hypertension, regional anaesthesia, visual analog scale (vas) pain, systolic blood pressure, diastolic blood pressure, etc

Introduction

General anaesthesia or general anesthesia (see spelling differences) is a medically induced coma with loss of protective reflexes, resulting from the administration of one or more general anaesthetic agents. It is carried out to allow medical procedures that would otherwise be intolerably painful for the patient; or where the nature of the procedure itself precludes the patient being awake.

A variety of drugs may be administered, with the overall aim of ensuring unconsciousness, amnesia, analgesia, loss of reflexes of the autonomic nervous system, and in some cases paralysis of skeletal muscles. The optimal combination of drugs for any given patient and procedure is typically selected by an anaesthetist, or another provider such as an operating department practitioner, anaesthetist practitioner, physician assistant or nurse anaesthetist (depending on local practice), in consultation with the patient and the surgeon, dentist, or other practitioner performing the operative procedure.

Attempts at producing a state of general anaesthesia can be traced throughout recorded history in the writings of the ancient Sumerians, Babylonians, Assyrians, Egyptians, Greeks, Romans, Indians, and Chinese. During the middle Ages, scientists and other scholars made significant advances in the Eastern world, while their European counterparts also made important advances.

The Renaissance saw significant advances in anatomy and surgical technique. However, despite all this progress, surgery remained a treatment of last resort. Largely because of the associated pain, many patients chose certain death rather than undergo surgery. Although there has been a great deal of debate as to who deserves the most credit for the discovery of general anaesthesia, several scientific discoveries in the late 18th and early 19th centuries were critical to the eventual introduction and development of modern anaesthetic techniques [1].

Two enormous leaps occurred in the late 19th century, which together allowed the transition to modern surgery. An appreciation of the germ theory of disease led rapidly to the development and application of antiseptic techniques in surgery. Antisepsis, which soon gave way to asepsis, reduced the overall morbidity and mortality of surgery to a far more acceptable rate than in previous eras. Concurrent with these developments were the significant advances in pharmacology and physiology which led to the development of general anaesthesia and the control of pain. On 14 November 1804, Hanaoka Seishū, a Japanese doctor, became the first person to successfully perform surgery using general anaesthesia.

In the 20th century, the safety and efficacy of general anaesthesia was improved by the routine use of tracheal intubation and other advanced airway management techniques. Significant advances in monitoring and new anaesthetic agents with improved pharmacokinetic and pharmacodynamic characteristics also contributed to this trend. Finally, standardized training programs for anaesthesiologists and nurse anaesthetists emerged during this period.

The biochemical mechanism of action of general anaesthetics is not well understood [citation needed]. Theories need to explain the function of anaesthesia in animals and plants [2]. To induce unconsciousness, anaesthetics have myriad sites of action and affect the central nervous system (CNS) at multiple levels. Common areas of the central nervous system whose functions are interrupted or changed during general anaesthesia include the cerebral cortex, thalamus, reticular activating system, and spinal cord. Current theories on the anaesthetized state identify not only target sites in the CNS but also neural networks and loops whose interruption is linked with unconsciousness [3]. Potential pharmacologic targets of general anaesthetics are GABA, glutamate receptors, voltage-gated ion channels, and glycine and serotonin receptors. Halothane has been found to be a GABA agonist [4]. and ketamine is an NMDA receptor antagonist [5].

Spinal anaesthesia (or spinal anesthesia), also called spinal block, subarachnoid block, intradural block and intrathecal block [6]. is a form of neuraxial regional anaesthesia involving the injection of a local anaesthetic or opioid into the subarachnoid space, generally through a fine needle, usually 9 cm (3.5 in) long. It is a safe and effective form of anesthesia performed by nurse anesthetists and anesthesiologists which can be used as an alternative to general anesthesia commonly in surgeries involving the lower extremities and surgeries below the umbilicus. The local anesthetic or opioid injected into the cerebrospinal fluid provides anesthesia, analgesia, and motor and sensory blockade. The tip of the spinal needle has a point or small bevel. Recently, pencil point needles have been made available (Whitacre, Sprotte, Gertie Marx and others) [7].

Spinal anaesthesia is the technique of choice for Caesarean section as it avoids a general anaesthetic and the risk of failed intubation (which is probably a lot lower than the widely quoted 1 in 250 in pregnant women [8]. It also means the mother is conscious and the partner is able to be present at the birth of the child. The post-operative analgesia from intrathecal opioids in addition to non-steroidal anti-inflammatory drugs is also good.

Spinal anesthesia is a favorable alternative, when the surgical site is amenable to spinal blockade, for patients with severe respiratory disease such as COPD as it avoids potential respiratory consequences of intubation and ventilation. It may also be useful, when the surgical site is amenable to spinal blockade, in patients where anatomical abnormalities may make tracheal intubation very difficult. In pediatric patients, spinal anesthesia is particularly useful in children with difficult airways and those who have are poor candidates for endotracheal anesthesia such as increased respiratory risks or presence of full stomach [9]. This can also be used to effectively treat and prevent pain following surgery, particularly thoracic, abdominal pelvic, and lower extremity orthopedic procedures [10].

Regardless of the anaesthetic agent (drug) used, the desired effect is to block the transmission of afferent nerve signals from peripheral nociceptors. Sensory signals from the site are blocked, thereby eliminating pain. The degree of neuronal blockade depends on the amount and concentration of local anaesthetic used and the properties of the axon. Thin unmyelinated C-fibres associated with pain are blocked first, while thick, heavily myelinated A-alpha motor neurons are blocked moderately. Heavily myelinated, small preganglionic sympathetic fibers are blocked last. The desired result is total numbness of the area. A pressure sensation is permissible and often occurs due to incomplete blockade of the thicker A-beta mechanoreceptors. This allows surgical procedures to be performed with no painful sensation to the person undergoing the procedure.

Some sedation is sometimes provided to help the patient relax and pass the time during the procedure, but with a successful spinal anaesthetic the surgery can be performed with the patient wide awake.

When assessing a patient for anaesthesia, ask about related illnesses such as ischaemic heart disease, renal failure and cerebrovascular disease. This can assess the extent of hypertensive end organ damage, and therefore risk for anaesthesia. Initial investigations which should be considered include electrocardiography (ECG) and electrolyte measurement. ECG changes which may include left ventricular hypertrophy, bundle branch block and evidence of old myocardial infarction such as Q waves. In breathless patients a chest radiograph should be performed, and if significant cardiac disease is suspected an exercise tolerance test. Approximately ninety percent of patients have idiopathic (no underlying cause) hypertension, but any treatable causes such as endocrine tumours, renal disease and pregnancy related disorders such as pre-eclampsia should be excluded. Patients with uncontrolled hypertension requiring urgent surgery may benefit from regional anaesthetic techniques to avoid the risks of general anaesthesia, for example an ankle block for toe amputation.

Patients with hypertension are often asymptomatic, and preoperative assessment with routine blood pressure measurement, is often the first manifestation of any potential problem. Blood pressure is measured according to the Korotkoff sounds which represent turbulent flow within the artery. Systolic blood pressure is measured at the first sound, and diastolic between the fourth and fifth sounds, which represents the point before absence of turbulent flow. Incidental hypertensive findings may indicate long standing hypertensive disease. In order to determine this, a series of blood pressure measurements, taken with the correct size cuff. This is calculated by measuring the circumference of the subject’s upper arm.

A suitable standard cuff between this value and 20% greater than the arm circumference is used. Measurements should be made of a period of time to determine a consistent rise in pressure. Current guidelines suggest two subsequent measurements over a period of 2 weeks using the best conditions available. This however is not appropriate in the acute surgical setting in patients requiring urgent surgery. A number of preoperative blood pressure readings may be taken over 2 – 3 hours with the patient resting. Frequently blood pressure reduces over this time, indicating underlying anxiety as a likely cause. Those patients with isolated “white coat” hypertension have not been shown to be at higher risk from anaesthesia than controls and therefore surgery should not be delayed unnecessarily. Elderly patients with systolic blood pressures below 180 / 190 mmHg should also be considered for surgery, particularly if there is little evidence of end organ damage, as these values are considered in the normal range for elderly patients due to normal physiological change.

Cardiovascular stability is important during anaesthesia and the perioperative period. Hypertensive patients are at risk of greater swings of blood pressure than the normal population and it has been shown that blood pressure lability can be associated with increased cardiovascular morbidity and mortality postoperatively, particularly in patients with severe uncontrolled hypertension. Optimisation of such patients with investigation and drug treatment can improve long term outcome and prevent such complications. Patients who have hypertension require a higher blood pressure for adequate organ perfusion than normotensive patients – this is particularly in the elderly. Avoidance of hypotension (and apparent normotension in patients who normally rely on higher values in everyday life), may prevent complications of underperfusion.

Hence based on above findings the present study was planned for Evaluation of VAS Score in Patients Undergoing Surgery Diagnosed with Hypertension Undergoing the General and Regional Anesthesia.

Methodology

The present study was planned in Department of Anesthesia and Critical Care, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. The study was conducted from the duration of March 2019 to October 2019. Total 30 cases of the hypertensive patients undergoing surgery by General and regional anaesthesia were enrolled in the present study. The 15 cases were enrolled in the Group A as patients undergoing the General Anesthesia. The remaining 15 cases were enrolled in Group B as Regional anesthetic cases. The post-operative VAS pain score among the patients of both the groups were retrieved for the study.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Results & Discussion

Anaesthesia Comprises of analgesia, unconsciousness, relaxation and suppression of reflexes. This state of Anaesthesia can be achieved either by regional or General Anaesthesia (GA). In G.A all the four parameters are fulfilled, where as in regional Anaesthesia the patient need not be unconscious. Pediatric patients are a special group in that their requirements cannot be expressed by themselves. The commonly adopted method of Anaesthesia in children is G.A as per the traditional standards. In G.A, the patients are kept in an unconscious state that will have its own complications.

Table 1: Basic Characteristics

Groups	Group A	Group B
Age (years)	41 – 65	43 – 59
Weight (kg)	68 – 79	65 – 81
Sex		
Males	4	5
Females	11	10
BMI kg/cm2	20.9 – 26.4	21.9 – 25.4
Alcohol Intake		
Yes	3	2
No	12	13
Smoking		
Yes	2	4
No	13	11

Table 2: Mean VAS Score

Groups	Group A	Group B
Time		
0 hr	1	1
1 hr	3	1
2 hr	4	1
3 hr	5	1
4 hr	3	2
5 hr	2	3
6 hr	1	4
8 hr	1	2
12 hr	1	1

Preexisting hypertension is the most common medical reason for postponing surgery [11]. Hypertension is well known to be a risk factor for cardiovascular catastrophe, a risk that logically extends into the perioperative period [12, 13]. In a case-control study of 76 patients who died of a cardiovascular cause within 30 days of elective surgery, a preoperative history of hypertension was four times more likely than among 76 matched controls [14].

Sympathetic activation during the induction of anesthesia can cause the blood pressure to rise by 20 to 30 mmHg and the heart rate to increase by 15 to 20 beats per minute in normotensive individuals [15]. These responses may be more pronounced in patients with untreated hypertension in whom the systolic blood pressure can increase by 90 mmHg and the heart rate by 40 beats per minute.

The mean arterial pressure tends to fall as the period of anesthesia progresses due to a variety of factors, including direct effects of the anesthetic, inhibition of the sympathetic nervous system, and loss of the baroreceptor reflex control of arterial pressure. These changes can result in episodes of intraoperative hypotension. Patients with preexisting hypertension are more likely to experience intraoperative blood pressure lability (either hypotension or hypertension) [16], which may lead to myocardial ischemia [17].

Blood pressure and heart rate slowly increase as patients recover from the effects of anesthesia during the immediate postoperative period. Hypertensive individuals, in particular, may experience significant increases in these parameters [18].

Cardiovascular system regulation depends on three systems: the sympathetic nervous system, the renin-angiotensin system (RAS), and vasopressin, and general anesthesia interferes with both the sympathetic nervous system and the RAS [19]. Similarly, epidural anesthesia, beyond sympathetic blockade, suppresses renin release in response to arterial hypotensionn [20] The anesthesia-induced reduction in sympathetic tone on the vascular capacitance results in a decreased effective intravascular volume, and angiotensin II may counterbalance this effect [21]. Accordingly, blood pressure may decrease markedly during general anesthesia when angiotensin II action is impeded by an angiotensin II competitive inhibitor [22]. Yet, besides RAS and the sympathetic system, endogenous vasopressin may be involved in blood pressure regulation during anesthesia through binding to receptors involved in vasoconstriction (V1a receptors) [23]. During epidural anesthesia and enalaprilat-induced inhibition of the RAS, the plasma vasopressin concentration increases significantly. Vasopressin may compensate both systems blockade through a mesenteric vasoconstriction with blood flow redistribution away from the mesenteric circulation towards shorter-time-constant circulatory territories, therefore increasing venous return indirectly [23].

Anesthesia induction should be induced by titration in case of severe hypertension grade or preoperative uncontrolled blood pressure. Propofol which is known to interfere with vasoreactivity may increase the risk of hypotension, but it can be minimized by slow induction. Blood pressure monitoring is mandatory, but most of the time, intermittent measurement through an automated-cuff is enough. Continuous measurement through an arterial line should be considered in case of emergency surgery in a patient with high-grade uncontrolled hypertension, if not justified by the surgery itself. Nevertheless, the real danger is lowering too much blood pressure, and then exposing organs to ischemia. It would be more adapted to measure perfusion/ischemia of various organs, but this remains difficult in clinical practice beyond myocardial ischemia with automated analysis of ST segment. Cerebral near-infrared spectroscopy, which can monitor the oxygen content of cerebral tissue, is an attractive noninvasive monitoring of cerebral microcirculation [24]. However, so far, clinical studies have failed to show that interventions to correct cerebral desaturation improve neurological outcomes in high risk surgery like cardiac surgery [25].

However, episodes of hypotension are brief and easily treated in most cases by the administration of fluid IV and short term vasopressors. Sympathetic agonists such as phenylephrine and ephedrine are effective in most cases [26]. Vasopressin agonist, like terlipressin, has been used as alternative to catecholamine. Terlipressin seems easy to use, as a single shoot injection, but it is a pro-drug converted into lysine vasopressin for many hours, a kinetic not adapted to treat short episode of hypotension. Terlipressin is as effective as norepinephrin to restore blood pressure but at the expense of an increase in blood lactate levels that reflects anaerobic condition in the bowels [27].

Conclusion

The increased intra-operative fluctuations and reduced post-operative pain among the patients in the regional anaesthesia group in comparison to those under general anaesthesia group. Hypertension is a modifiable risk factor for cardiovascular diseases and outcomes, and the same is true of the patient presenting for surgery.

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