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Research Article

Challenges of Administering General and Spinal Anesthesia and Hemodynamic Changes in Hernia Repair Patients

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Abstract

Introduction: Choosing an anesthetic that presents the least danger to the patient's life continues to be the top priority for the Anesthesia and Critical Care Department personnel when it comes to techniques, medications, tactics, and recommendations for choosing the optimal anesthesia. The most popular and efficient kind of anesthetic for those who repair hernias is spinal anesthesia.

Subjects and methods: an accurate and up-to-date study of the patients. Based on the types of spinal and general anesthesia, we divided the 100 patients who had herniotomy into two groups: 50 patients received spinal anesthesia, while the remaining 50 patients received general anesthetic. The patient's age, weight, pulse rate, and blood pressure change were all analyzed. The study divided patients between the ages of 20 and 90 into two groups: General Anesthesia (GA) and Spinal Anesthesia (SA) in order to do thorough follow-ups; before, during, and after operations.

Results: We demonstrate that it is also more stable in SA, which is around 56%, compared to GA, which is roughly 40%. However, blood pressure is higher in GA, which was 32%, and in SA, which was 24%, and lower in GA, which was 28%, and in SA, it was 20%. As demonstrated in this study, the heart rate is more stable in SA (56%) compared to GA (32%), and it increases in SA (34%), while it increases in GA (60%). The impact of (SA) is more consistent, and the heart rate dropped by 10% in (SA) and around 8% in (GA).

Conclusion: We found that spinal anesthesia was better than general anesthesia at preserving blood pressure stability and a minimum or normal heart rate.

Introduction

The need for anesthesia during the procedure and postoperative analgesic medicine are two challenges associated with hernia treatment methods. Both spinal and general anesthesia are used during open inguinal hernia surgery [1]. Children with hypertension are known to experience end-organ damage and are at risk of developing hypertension as adults, despite the fact that little is known about the long-term effects of chronic hypertension in children [2]. In adults, hypertension is a significant risk factor for renal damage, coronary artery disease, and stroke. The American Society of Anesthesiologists standard for monitoring calls for monitoring the patient's breathing, oxygenation, circulation, and temperature. In addition to usual monitoring, pre- and post-ductal oxygen saturation must be measured using a second pulse oximeter. An aggravation of pulmonary hypertension may be indicated by the beginning of a gradient between the pre-and post-ductal oxygen saturations [3]. Propofol lowers systemic vascular resistance, preload, and myocardial contractility to lower arterial blood pressure. These effects are exacerbated by higher dosages, heart issues, and age extremes. Injection pain and few instances of thrombophlebitis approximately (58%) of injectable propofol users report experiencing pain [4]. Even

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though most patients' blood pressure should return to normal a few months before surgery, mild to severe diastolic or systolic hypertension does not raise the risk of anesthesia. Moderate to small increases need not be sensitively addressed in the days before surgery. Increased operational risk is associated with higher blood pressure, which should be carefully managed prior to surgery [5]. Since Bassini's first description of inguinal hernia surgery was published in (1887), several hernia repair techniques have been documented, such as Shouldice, Darning, Modified Bassini, Lichtenstein mesh repair, and the more recent laparoscopic approach. Due to their short recovery periods and low rates of recurrence, laparoscopic and Lichtenstein mesh repairs have grown in popularity recently [6]. Ineffective endotracheal intubation and pulmonary aspiration of stomach contents are the two primary causes of maternal morbidity and death under general anesthesia. One to two hours before general anesthesia is induced, patients with additional risk factors that raise their risk of aspiration should be given intravenous ranitidine (50 mg), metoclopramide (10 mg), or both. A potentially problematic airway, reflux symptoms, morbid obesity, and emergency surgery performed without a planned fasting period are some of these risk factors. Antacid prophylaxis against aspiration pneumonia should be administered to all patients (30 to 45 minutes) before induction using (30 mL) of sodium citrate. (40 mg) of omeprazole taken orally as a premedication [7]. Propofol's main cardiovascular effect is a decrease in arterial blood pressure because it lowers preload, cardiac contractility, and systemic vascular resistance (sympathetic vasoconstrictor activity inhibition). The stimulation required for laryngoscopy and intubation frequently reverses hypotension after induction. Other factors, including large dosages, rapid injections, and advanced age, are also associated with propofol-induced hypotension. Propofol dramatically reduces the response of normal arterial baroreflexes to hypotension [8]. In order to induce a single vital-capacity breath inhalation in (67) persons, it was shown that sevoflurane or isoflurane mixed with (67%) nitrous oxide was not suitable [9]. The hemodynamic reactions to halothane induction and maintenance of anesthesia were compared with those to sevoflurane in (68) unplanned children aged (1-3) who were having adenoidectomy [10]. Not all operations can be performed using the three anesthetic options available for open groin hernia treatment. The ideal anesthetic technique must fulfill specific requirements. It should be as easy and safe as possible, with few postoperative complications. It needs to be affordable, give the patient a speedy recovery after surgery without any negative consequences, and be painless [11]. The FFM (Fat-Free-Mass) scalar may be a preferable option for bolus dosage, according to clinical pharmacology studies conducted on obese individuals [12]. Postoperative hypotension is another risk factor for myocardial injury after Noncardiac surgery [13]. The best anesthetic for avoiding reflex bronchoconstriction during anesthesia could be propofol Compared to inhaled sevoflurane, children at risk experienced fewer adverse respiratory events when IV propofol was used to induce anesthesia in a randomized study [14]. The primary objective of the study is because patients undergoing hernia surgery under spinal and general anesthesia were unable to achieve circulatory stability, we devised clear techniques to avoid this problem and eliminate all issues concerned. The second important goal is to decrease morbidity and death and unwanted complications from anesthesia such as high and low blood pressure and heart rate.

Subjects and methods

One hundred patients in all had herniectomy operations in this study. They were split into two equal groups of fifty each, with one group having spinal anesthesia and the other having general anesthesia. Numerous factors, such as the patients' age, weight, blood pressure variations, and pulse rate, were assessed. The subjects, who ranged in age from twenty to ninety, were divided into two groups: one for General Anesthesia (GA) and another for Spinal Anesthesia (SA). We created a list of variables that might be observed in the operating room and arranged them into three different time periods: before, during, and following the surgery. Blood pressure measurements and related factors, such as cases of hypertension or hypotension, heart rate fluctuations, and Mean Arterial Pressure (MAP), which may suggest the patient is in shock as a result of fluid depletion or cardiac problems, were among the data gathered. Inhaled anesthetics should be used with caution since they might cause hypotension. The amount of inhaled anesthetic needed to stop (50%) of people from moving in response to a standardized stimulus, like surgery, is known as the minimum alveolar concentration, or MAC. This metric acts as a benchmark for experimental assessments and enables comparisons of the potencies of various anesthetic drugs. By numbing the lower body, spinal anesthesia significantly reduces pain during surgery while preserving patient consciousness, making it a good substitute for general anesthesia. Spinal anesthesia can be used for the majority of procedures performed below the waist. A spinal anesthetic is administered by an anesthetist using Bupivacaine, the most commonly used and recommended drug in surgical operations. On the other hand, compared to other induction agents, propofol, the preferred medication for general anesthesia, has a significant effect on systemic blood pressure. The main cause of this is the considerable vasodilation that occurs in the venous and arterial systems, which lowers preload and afterload. With increasing age, in individuals with reduced intravascular fluid capacity, and after fast delivery, the impact on systemic blood pressure becomes especially noticeable. Additionally, the inhibition of the normal baroreflex response exacerbates the hypotensive effects, resulting in a negligible rise in heart rate even in the presence of vasodilation.

Results

In the study as seen in the Patient Distribution Table (Table 1) for Blood Pressure Change, blood pressure is more constant in SA (56%) compared to GA (40%); yet, blood pressure increases for GA in (32%) and in SA (24%), and blood pressure decreases more in GA (28%) and in SA (20%). In terms of blood pressure, the figures demonstrate that spinal anesthesia is more stable than general anesthesia.

Table 2 indicates that the heart rate in this study is more steady, with a percentage of (56%) in (SA) but 32% in (GA) and

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increases were (34%) in (SA) but (60%) in (GA). The percentage of drop in heart rate was (10%) in (SA) and around 8% in (GA), thus, the impact of (SA) is more stable.

Additionally, it can be seen in Figures 1,2 that the Mean Arterial Pressure (MAP) increased significantly during general anesthesia in contrast to the more stable values associated with spinal anesthesia.

In this study, the age of patients ranged from (20) to over (90) years, with an average of (48) years, the age group (26-40 years) showed the peak incidence of this study which was (46%) in GA and (44%) in SA, followed by age group (41-55 years) which was (24%) in the GA and (30%) in SA group then age group (55 and more than55) which was (12%) in GA and (18%) in SA, while age group less (25 years) was the least number, it was (8 %) of the SA (Figure 3).

In this study, Male and Female patients were selected and the number of Males was (27) in general anesthesia and (33) in spinal anesthesia making up (54%) Males and (66%) were Females as seen in Figures 4 and 5A.

We can discuss that the systolic blood pressure changes vary. Some patients experience a decrease during anesthesia (e.g., 121 to 115 mmHg) while others see an increase (e.g., 106 to 111 mmHg). After anesthesia, systolic BP generally increases from pre-anesthesia levels, but there are exceptions like the patient with (106/61 mmHg) before anesthesia who has

Table 1: Distribution of patients according to the change in blood pressure.

No. of patient	increase in blood pressure	Remain	Decrease in blood pressure	Total
(GA) - Group	16	20	14	50
	32%	40%	28%	100%
(SA) - Group	12	28	10	50
	24%	56%	20%	100%
Total	28	48	24	100
	28%	48%	24%	100%

Table 2: Distribution of patients according to the change in Heart rate.

NO. of patient	Increase In HR	Remain	Decrease In HR	Total
(GA) - GROUP	30	16	4	50
	60%	32%	8%	100%
(SA) - GROUP	17	28	5	50
	34%	56%	10%	100%
Total	47	44	9	100
	47%	44%	9%	100%

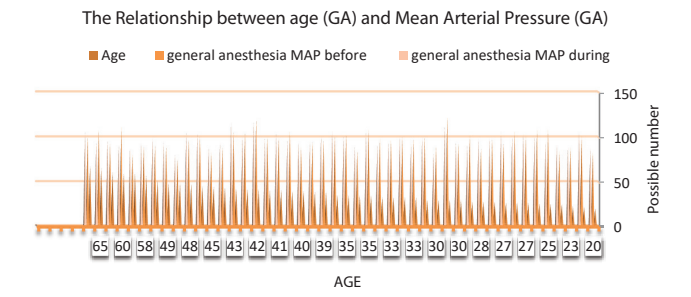

Figure 1: The relationship between age (GA) and Mean Arterial Pressure (GA).

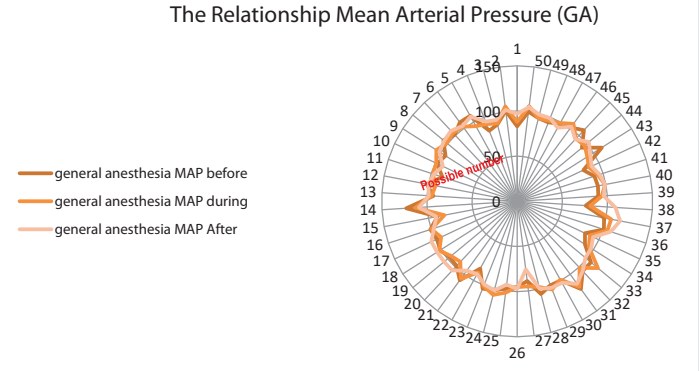

Figure 2: The relationship Mean Arterial Pressure for the (GA) group.

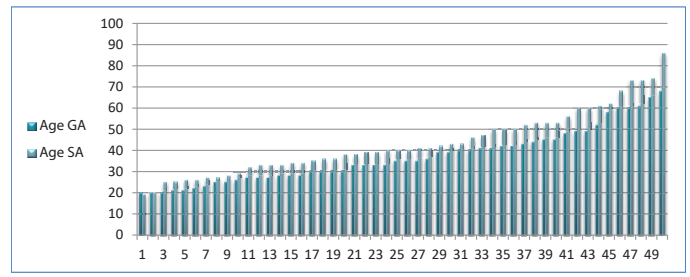

Figure 3: The relationship between age and (GA) vs. (SA).

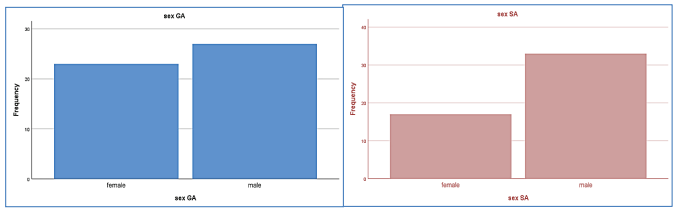

Figure 4: The relationship between sex and (GA) vs. (SA).

a dramatic increase to (154/77 mmHg) after. And Diastolic Changes, Diastolic BP changes are also mixed. A few patients see increases, while others experience decreases, For example, one patient has a significant drop in diastolic BP from (85 to 74 mmHg) after anesthesia, while another experiences an increase from (61 to 77 mmHg) after (Figure 5B).

Discussion

According to Courtney J. Balentine, inguinal hernia repair is the most common general surgical surgery carried out in the US. About 15% to 20% of these procedures are performed under general anesthesia, whereas 80% are performed under local anesthesia. We expected that as people aged, the benefits of local anesthetic versus general anesthesia for inguinal hernia surgery would grow [15]. According to Bay-Nielsen, regional anesthesia has the highest morbidity whereas local infiltration has the lowest. The elective groin hernia repair operation had a 30-day mortality rate of 0.12%. Patients who died within a week of the procedure were disproportionately more likely to have used regional anesthetics [16]. Salutations, Rodgers, Anthony Neuraxial blocking reduces serious issues, such as postoperative mortality. More research is needed to determine the extent of some of these advantages and whether they are

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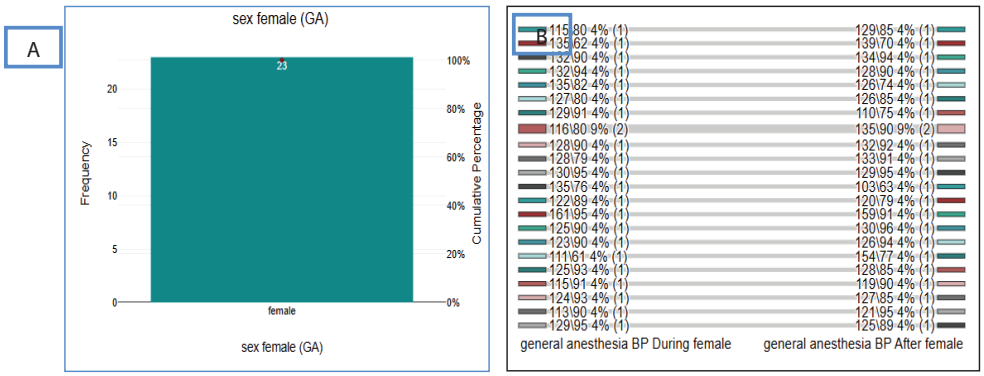

Figure 5: Relationship: (A) number of females in the GA group, (B) blood pressure during and after surgery for females in the GA group.

solely attributable to the avoidance of general anesthesia, all-cause mortality, DVT, pulmonary embolism, myocardial infarction, transfusion needs, pneumonia, other infections, respiratory depression, and renal failure [17]. In the 5–10 minute post-induction period, severe hypotension following anesthesia induction occurs more frequently than at previous times, according to David L. Reich. Conclusion: It is advisable to consider alternatives to propofol for inducing anesthesia in individuals over 50 with (ASA physical status ≥III). Within (0–10 minutes) following the induction of anesthesia, 9% of patients in routine clinical practice exhibited clinically severe hypotension [18]. The effects of spinal and general anesthesia on patients' hemodynamic stability were investigated by the study's authors, Al-Khikani, et al. Making repairs to a hernia Potential problems might occur since spinal anesthesia has been shown to be more stable than general anesthesia; nevertheless, the cardiovascular system is unaffected, and the benefit has to be enhanced by precise and correct work rather than dependence. It's critical to identify and correct deviations from the expected course of blood circulation. While spinal anesthesia was more stable, general anesthesia was linked to a significant rise in heart rate. Similarly, Mean Arterial Pressure (MAP) increased significantly during general anesthesia in contrast to the more stable values associated with spinal anesthesia. Furthermore, Blood Pressure (PB) remained more steady under spinal anesthesia but rose noticeably during general anesthesia. Hemodynamic stability is necessary to keep the heart's oxygen supply and demand in a healthy balance. This can be done using a number of drugs and techniques, including fentanyl mixed with isoflurane, sevoflurane, or propofol. Volatile anesthetics provide cardio-protective effects in a number of ways [13]. The scientific principles and training techniques align with the latest American Heart Association guidelines for CPR and emergency cardiovascular care [19]. The American Heart Association's Basic Life Support (BLS) course is highly recommended for healthcare professionals and other staff members who require instruction in performing Cardiopulmonary Resuscitation (CPR) and other vital cardiovascular life support treatments in a range of settings [20]. A considerable percentage of individuals undergoing general anesthesia frequently have Intraoperative Hypotension (IH) [21]. The occurrence of IH is linked to serious postoperative outcomes, such as cardiac damage, renal failure, and an increased risk of mortality [15]. Perioperative angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers affect the renin-angiotensin system, which can cause refractory hypotension after anesthesia [22]. A synthetic vasopressin analogue called TERLIPRESSIN (1 mg) has been used to treat refractory hypotension in patients who have taken angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers [23]. Vasopressin can be used to treat hypotension caused by severe catecholamine deficiency and allergies after pheochromocytoma excision [24].

Conclusion

The selection of an appropriate anesthetic technique is crucial for ensuring hemodynamic stability throughout surgical procedures. General anesthesia, while effective, is often associated with significant fluctuations in heart rate, mean arterial pressure, and blood pressure. In contrast, spinal anesthesia tends to offer a more stable cardiovascular profile, reducing these fluctuations. To optimize patient outcomes, it is essential to implement effective management strategies. This includes using tailored combinations of anesthetic agents, such as fentanyl in conjunction with volatile anesthetics like isoflurane, sevoflurane, or intravenous agents like propofol. The cardio-protective properties of volatile anesthetics further contribute to enhanced myocardial protection, promoting safer perioperative conditions. These considerations highlight the value of careful anesthetic planning, ensuring not only effective sedation but also improved patient safety during the perioperative period.

Ethical approval

Ethical clearance was granted by the Research Committee of Karbala Health Directorate under the supervision of the Center for Training and Human Development (Ref. no. 2024-03).

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and provide all possible services Competing Interests All the authors declare that there are no conflicts of interest.

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