International Journal of Innovations & Research Analysis (IJIRA)
ISSN :2583-0295, Impact Factor: 6.238, Volume 04, No. 01(II), January- March, 2024, pp 99-106

IMPACT OF PRE-HYPOTENSION

Dr. Suman Gupta*
Dr. Rajkumar Gupta**
Dr. Anand Agarwal***
Parkhi Gupta****
Pradiyumn Thapak*****

ABSTRACT

One of the primary focuses of this inquiry on the effects of intravenous hypertonic saline administered prior to surgical procedures was hypotension that occurred following the induction of general anesthesia. The normal saline solution (13 ml/kg) or the hypertonic saline 5% solution (2.3 ml/kg) was administered to fifty patients who were scheduled to undergo elective surgery. Every group was given a number that was chosen at random. The administration of a hypertonic saline infusion that lasted for thirty minutes was carried out thirty minutes before the beginning of the anesthesia. During the process of giving anesthesia to each individual patient, a standard procedure was followed. A patient's age, gender, body mass index (BMI), blood pressure (both systolic and diastolic), heart rate (HR), and mean arterial pressure (MAP) were all assessed. A mean age of 36.68 years, with a standard deviation of 10.8 years, was documented for the patients. Forty percent of the patients were male for the group. In terms of the mean systolic blood pressure (SBP) at minutes 2 and 5, the mean diastolic blood pressure (DBP) at minutes 2, 5, and 15, the mean heart rate (HR) at all time periods, and the mean maximum arterial pressure (MAP) at minutes 2 and 15, there was no significant difference between the groups. There was a significant difference between the normal group and the hypertonic saline group in terms of the mean systolic blood pressure (SBP) at minutes 10 and 15, the mean diastolic blood pressure (DBP) at minute 10, and the mean mean arterial pressure (MAP) at minutes 5 and 10, with the hypertonic saline group achieving a significantly higher value relative to the normal group ($P < 0.05$). It was determined that there was no statistically significant difference between the groups in terms of the trends of SBP, DBP, HR, and MAP ($P > 0.05$). The administration of a 5% hypertonic saline infusion (2.3 mg/kg) before to general anesthesia resulted in a positive reduction in both the mean arterial pressure (MAP) and the heart rate. Furthermore, there were no instances of severe hypotension that occurred.

Keywords: *Pre-Hypotension, Impact, Hypertonic Saline.*

Introduction

It is important to note that even if the bouts of hypotension that occur during the first stage of resuscitation are short, the death rates that occur following brain injuries are much greater. The findings of these prospective trials bring to light the need of early continuous monitoring and efficient treatment of hypotension in patients who have suffered serious brain injuries. Primary and secondary healthcare, especially that which deals with traumatic brain injuries, would substantially benefit from the ability to foresee hazardous hypotensive episodes. These episodes occur when a patient's arterial blood pressure drops to levels that are dangerously low. The vital signs of hospitalized patients, such as their blood pressure, temperature, and heart rate, are meticulously recorded in the databases that are used in the

* MBBS, MS & Assistant Professor (Gynec & Obst Department), SNMC, Agra, UP, India.
** MBBS, MD, FIACM, FISC, FIAE and FIDA & Consultant – Preventive and Clinical Cardiology, Agra Medicity Hospital, Agra, UP, India.
*** MD, DM (Cardiology), FESC, Ex Assistant Professor Cardiology, J.L.N. Medical College, Ajmer, Rajasthan, India.
**** MBBS Student Government Autonomous Medical Collage, Firozabad, UP, India.
***** Medical Student of MVASMC, Mirzapur, UP, India.

medical field. We are hoping that by collecting and methodically analyzing a sufficient number of these data points, we will be able to design a system that will be able to predict when hypotensive episodes will begin and then send out a warning immediately.

Consequently, this laid the groundwork for the Avert-IT project, which was a collaborative venture supported by the European Union that used data federation techniques to collect relevant information for the sake of research and system development. A hypotension alarm system that made use of Bayesian neural networks was supposed to be constructed as part of this project according to its objectives. It is impossible to emphasize the significance of the project's commercialization, particularly when one considers the fact that previous to this work, there was no market solution available for the problem of hypotensive prediction existing. It is true that there are a number of commercial systems that are capable of predicting future clinical states; however, none of these systems are able to give a probabilistic quantification of information that is reliant on the context. One such example is the device known as the Bio Sign. By using a number of important signs, such as the rate at which the heart beats and the rate at which the breath is taken, it is possible to generate an index that may suggest cardiovascular instability.

The Avert-IT team came to the conclusion that a Bayesian approach to training an Artificial Neural Network (ANN) was the most effective strategy for teaching the system to recognize hypotensive episodes by making use of input data from relevant parameters. This decision was reached after thorough consideration of the benefits and drawbacks associated with each method. Because of its efficiency in categorizing and modeling very nonlinear connections while taking into account probabilistic elements, the BANN was chosen for application. Among the clinical inputs that are involved, it is predicted that these qualities will play a key role.

The necessity of examining the complexities of how the human body works has been brought to light by research conducted in recent years. In the field of medicine, one of the most common tasks is to determine the level of complexity of a number of different bio signals, such as DNA, ECG, and EEG. The complexity of electrocardiogram (ECG) signals is a diagnostic tool that is fundamentally important since it describes processes. Time series prediction is a challenging topic in a wide variety of technological and scientific fields; it also has applications in the medical field, and forecasting systems make use of a wide variety of models and approaches.

Literature Review

Hajjar, I. (2005). It is a natural consequence of aging that our ability to maintain hemodynamic stability in the face of changes in posture becomes less effective. It is because of this that senior people are more likely to get orthostatic hypotension (OH), which is a potentially fatal dip in blood pressure that occurs when they stand. When it comes to a particular demography, the prevalence of OH may be deceiving. People who live in institutions or acute care settings have higher percentages, but people who live in the community have lower rates, which range from five percent to sixty percent. OH has been linked to a wide range of variables, including but not limited to older age, bed rest, low body mass index, and the use of medications. In spite of the fact that it is theoretically conceivable for antihypertensive medicines to make OH worse when taken combined, the majority of cross-sectional studies have failed to establish that this is the case. The changes in postural blood pressure (PBP) are also improved by antihypertensive medication, according to prospective randomized trials. Peripheral vasodilators, which include α-adrenoceptor antagonists and nondihydropyridine calcium channel antagonists, have the potential to exacerbate PBP changes and induce OH when considering the individual classes. Drugs that have an intrinsic sympathomimetic activity, such as angiotensin-converting enzyme (ACE) inhibitors, angiotensin-receptor antagonists, and β-adrenoceptor antagonists, are less likely to exacerbate the symptoms of OH. It is possible to lessen the likelihood of developing OH when taking diuretics by meticulously managing the electrolyte imbalance that occurs. This is a problem that will grow increasingly prevalent among medical professionals as the population continues to age. A comprehensive patient history, a precise measurement of orthostatic blood pressure, and a careful examination of the autonomic nervous system are all potential sources of clinical guidance for the management of orthostatic hypotension (OH). It is possible that the use of antihypertensive medicine is a risk-free method of lowering the risk of arterial hypertension in hypertensive individuals who did not have the condition prior to treatment. It is possible that avoiding the courses that make hypertension worse and making cautious use of the classes that alleviate variations in blood pressure is a therapeutic strategy that is both safe and beneficial for patients who have hypertension before to therapy or who develop hypertension while taking antihypertensive medication.

Shafi, S., & Gentilello, L. (2005). Studies of pre-hospital endotracheal intubation (ETI) conducted by separate emergency medical services (EMS) systems may have produced contradictory results. This might be attributed to regional differences in the education and skill of paramedics. According to a different idea, the percentage of fatalities that occur in severely injured hypovolemic patients is greater. This is because hypotension, which is caused by positive pressure breathing, is the cause of the hypotension. Researchers studied data from the National Trauma Data Bank (NTDB, 1994–2002) in order to take into consideration the fact that different states have different policies regarding the education and experience of paramedics. All of the patients who had a pre-hospital GCS that was less than 8 (which indicates a high risk of early ETI) and an ISS that was more than 16 (which indicates a high likelihood of hypovolemic) were included in our study. A comparison was made between patients who received intubation outside of a hospital environment (n = 871) and those who had the procedure performed in an emergency department setting (n = 6581). Patient numbers were compared. Logistic regression was performed to determine whether or not pre-hospital ETI was a single predictor of hypotension and mortality. This was done after taking into account age, ISS, injured body area, AIS scores, pre-hospital IV fluids, and other covariates. Because of the possible impact that ETI and positive pressure breathing may have on these outcomes, we decided against using physiological parameters as predictors. With the exception of head injuries (emergency department 83%, pre-hospital 71%, $p < 0.001$) and ISS (emergency department 33 ± 0.2, pre-hospital 36 ± 0.6, $p < 0.001$), the groups were comparable in terms of age, gender, the structural distribution of injuries, the chance of having at least one major injury (AIS > 3), and other features. Subjects who were intubated while they were out in the field had a greater risk of being hypotensive when they arrived at the emergency room (33% vs 54% pre-hospital, $p < 0.001$). Furthermore, their survival rate was lower (45% against 24% pre-hospital, $p < 0.001$), indicating these subjects had a decreased chance of surviving. It was shown that pre-hospital ETI was able to independently predict both hypotension at admission in the emergency department (odds ratio: 1.7, 95% confidence interval: 1.46 −2.09, $p < 0.001$) and lower survival (odds ratio: 0.51, 95% confidence interval: 0.43 −0.62, $p < 0.001$), even when taking into account potential confounding factors. The use of pre-hospital endotracheal intubation in trauma patients has been associated to both hypotension and a decreased likelihood of survival. When hypovolemic circumstances are present, positive pressure breathing may play a role in moderating the situation.

Hirsch, J., DePalma, G., Tsai, T. T., Sands, L. P., & Leung, J. M. (2015). Individuals who are older often have surgical delirium. Pathogenesis is still not well understood, despite the fact that it plays a significant role in prognosis. Despite the fact that a number of risk factors have been identified, none of them are reversible, particularly those that are susceptible to being changed by the administration of anesthesia. In the course of this prospective cohort study, the main purpose was to investigate the possibility of a connection between intraoperative hypotension and postoperative delirium in elderly patients who had undergone important non-cardiac procedures. Participants were older persons (65 years of age or older) who were taking part in an ongoing prospective observational study that was exploring the factors that lead to postoperative delirium after major outpatient procedures that did not involve the heart. In order to evaluate whether or not the patient had hypotension, intraoperative blood pressure measures were combined with predetermined criteria. The Confusion Assessment Method was used in order to evaluate the patient's level of delirium during the first two days after surgery. For the purpose of applying multiple comparison correction to the data, ordered logistic regression multivariable models, two-sample proportion tests, and t-tests were used. The average age of the 594 patients whose data was evaluated was 73.6 years, with a standard deviation of 6.2 years. On the first day, a total of 178 (30%) of the patients had delirium, and on the second day, 176 (30%) of the patients experienced delirium. Patients who had delirium were more likely to be older, female, to have worse cognitive scores before to surgery, and to have operations that were longer in general. There was no statistically significant correlation between postoperative delirium and either relative hypotension (decreases of 20, 30, or 40%) or absolute hypotension (mean arterial pressure (MAP) less than 50 mm Hg), nor was there any correlation between the duration of hypotension (MAP less than 50 mm Hg) and postoperative delirium. On the other hand, there was a significant correlation between intraoperative blood pressure change and postoperative delirium for the patient. Rather than absolute or relative hypotension, these studies indicated that higher blood pressure fluctuations were associated of delirium after surgical procedures.

Gharabaghi, A., Koerbel, A., Samii, A., Kaminsky, J., Von Goesseln, H., Tatagiba, M., & Samii, M. (2006). A group of symptoms known as the trigeminocardiac reflex (TCR) may manifest itself after surgical procedures performed on the fifth cranial nerve, which may be located either within or outside of

the skull. Among these symptoms include bradycardia or asystole, as well as hypotension of the arterial walls' blood vessels. Following the administration of vestibular schwannoma (VS) surgery, the authors investigated the impact that this reaction had on the patients' capacity to hear following the treatment. This prospective research was conducted with the intention of determining the parameters that contribute to postoperative hearing function in a group of one hundred persons who were scheduled to undergo VS surgery. A number of parameters were taken into consideration during the evaluation, including the patient's age, gender, auditory function both before and after surgery, mean arterial blood pressure before to surgery, any preexisting medical disorders or drugs (such as antiarrhythmia medications), the size and location of the tumor, and the presence of the TCR itself throughout the surgical procedure. It was shown that the transcranial cochlear excision had an effect on the postoperative hearing function of persons who had Hannover Class T3 and T4 VSs (9.1% of patients). Despite the fact that only 11.1% of patients in the TCR group and 51.4% of patients in the non-TCR group reported experiencing hearing loss after surgery, the overall percentage of patients who had hearing loss after surgery was 47%. An intraoperative TCR was associated with a significantly worse postoperative hearing function after VS surgery in cases with larger tumors (Hannover Class T3 and T4), with a p-value of 0.005. This was the case in cases where the tumors were larger. In patients who are undergoing VS surgery, hypotension after TCR is a factor that contributes to a poor prognosis for hearing preservation. It is possible to bring this to the attention of patients both before and after they undergo surgical procedures. For the purpose of better preserving hearing by reducing the occurrence of the transcranial pressure (TCR), further study on this phenomenon is required to expand our understanding of the mechanisms that are at play.

Research Methodology

After receiving clearance from the ethics committee at Isfahan University of Medical Sciences and receiving written informed consent from each patient, fifty patients who were scheduled to have elective surgery were split into two groups, each consisting of twenty-seven participants. The distribution of the patients was determined by a list of digits chosen at random. It was determined that patients were eligible for consideration if they were between the ages of 18 and 50, did not have a history of chronic disease, did not take any nonsteroidal anti-inflammatory drugs (NSAIDs) within two weeks prior to surgery, did not have systemic hypertension that was not under control, did not receive preoperative treatment for hypertension, did not have ischemic heart disease that was accompanied by clinical symptoms, and did not have a history of opioid use. Additional criteria for exclusion were patients who were having hemodynamic instability, which includes active bleeding, hypovolemia, or fluid loss. All of the patients were given 0.1 mg/kg of diazepam as a premedication before their elective surgery, and they were told to abstain from any and all drugs for a minimum of eight hours the night before the operation. Before beginning the treatment, a cannula measuring 16 gauge was inserted into a peripheral vein located in the cubital fossa. This was done in the operating room. In the HS group, the dose of HS 5% that was administered to patients was 2.3 mg/kg. Additionally, people in the NS group were given a dose of normal saline (NS) equal to 13 milligrams per kilogram of body weight. Over the course of thirty minutes, HS was injected into the patient's system thirty minutes before the first dose of anesthetic was administered.

The patient was put to sleep using a comprehensive intravenous approach that comprised infusions of 4 milligrams per kilogram of fentanyl, 5 milligrams per kilogram of sodium thiopental, and 0.5 milligrams per kilogram of atracurium. For the purpose of endotracheal intubation, a single-lumen tube was used. For the purpose of maintaining a balanced level of anesthesia, morphine (0.1 mg/kg) and isoflurane (1-2%) were inhaled and administered. The same settings were employed for the lungs of the patients during mechanical ventilation: VT at 10 mL/kg and RR at 10 minutes for the course of the procedure. By carefully managing the ventilation, we were able to maintain an end-tidal CO2 level that was between 35 and 40 mmHg. When monitoring and recording the vital signs of the patients, several instruments such as electrocardiograms, non-invasive arterial blood pressure monitors, and pulse oximeters were used.

Clinical indicators such as systolic and diastolic blood pressures, heart rates, and mean arterial pressures (MAPs) were measured for each and every patient. Age, gender, and body mass index (BMI) were also taken into consideration throughout the evaluation process. In order to test the mean arterial pressure (MAP), systolic blood pressure (SBP), and diastolic blood pressure (DBP) in any patient before to the research of drug delivery, as well as 2, 5, 10, or 15 minutes following injection, no invasive techniques were used. At each time point, there were three measurements made of the different blood pressures: SBP, DBP, heart rate, and MAP. The means of these measurements were used as the final results.

By using a two-sided log-rank test with a significance threshold of α = 0.05 and 80% power, the data that was used for the purpose of determining the sample size was utilized. The evaluation of all of the data that we obtained was carried out using SPSS-20. Variables were shown using the mean plus or minus the standard deviation (SD) and the number (percent). A t-test with independent samples was used to compare the different study groups in terms of age, body mass index, number of minutes under anesthesia, systolic blood pressure, diastolic blood pressure, heart rate, and mean arterial pressure (MAP). Intergroup comparisons of sex were performed using the Chi-square test, and trends in systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and mean arterial pressure (MAP) were analyzed with repeated-measures analysis of variance (ANOVA) at a number of different time periods. When the P-value was less than 0.05, statistical significance was considered to have been reached.

Data Analysis

Figure 1 depicts the flowchart that was used for the investigation. Six patients did not take part in the research, two patients did not provide their informed consent to participate, four patients did not meet the inclusion criteria, and there were sixty patients who were eligible to take part in the study. Following the completion of the enrollment process, fifty patients were randomly allocated to one of two groups, after which they were followed and assessed.

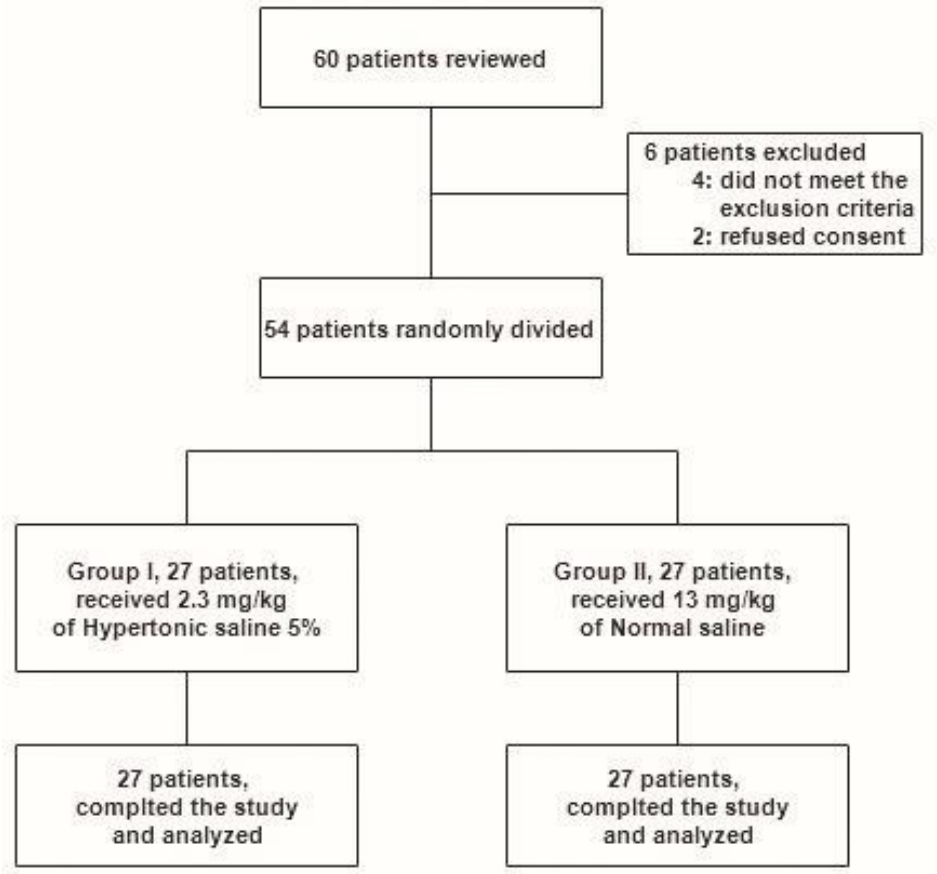

Figure 1: Study flowchart

Total mean age of the studied patients was

A mean body mass index of 26.12 ± 4.11 was observed, while the average age was 36.68 ± 10.8 years. A total of fifty individuals were examined, with 32 females and 22 males making up forty-one percent of the total. As can be seen in Table 1, the results indicate that there was not a statistically significant difference (P > 0.05) in these areas when comparing the baseline characteristics of the research groups with the clinical data.

Table 1: Baseline characteristics and clinical parameters in 50 studies patients by groups

Variables	Hypertonic Saline Group	Normal Saline Group	P Value
Age (year)	36.59±11.37	36.77±10.02	0.95
Body mass index	26.31±3.92	25.83±4.44	0.67
Male/Female	10 (37)/170 (63)	12 (56)/15 (44)	0.78†
Duration of anesthesia (min)	59.49±5.61	62.10±4.38	0.062
Systolic blood pressure (mmHg)	148.36±28.13	144.43±26.41	0.59
Diastolic blood pressure (mmHg)	77.25±16.85	83.51±10.35	0.11
Heart rate	98.76±15.23	101.16±20.03	0.62
Mean arterial pressure	99.55±19.14	103.92±11.42	0.31

The clinical parameters of the groups that were analyzed in Table 2 were compared with one another. At the 2, 5, 10, and 15 minute marks, the HS group had greater systolic blood pressure readings than the NS group did. This was in comparison to the NS group. It was determined that there were no significant variations in the mean SBP of the groups at minutes 2 and 5 ($P > 0.05$). In contrast, the group with high blood pressure (HS) had a significantly higher mean blood pressure (SBP) than the other group at minutes 10 and 15 ($P < 0.05$). The means of DBP at minutes 2, 5, and 15 did not show any statistically significant change ($P > 0.05$), as shown by the results. On the other hand, there was a difference that was statistically significant between the HS group and the NS group in terms of the minimum 10-minute DBP ($P = 0.022$). It was determined that there were no statistically significant differences between the groups in terms of their mean HR at any given time point ($P > 0.05$). $P > 0.05$ indicates that there was no significant difference in the mean MAP between the groups at the two-minute mark and the fifteen-minute mark. At the five-minute mark and the ten-minute mark, the group with high school students had a significantly higher mean MAP than the other group ($P < 0.05$). There were no statistically significant differences between the groups ($P > 0.05$) in terms of standard blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), or mean arterial pressure (MAP), and the trajectories in both groups were similar.

Table 2: Comparison of clinical parameters in 50 patients at time points in regard to study groups

	Hypertonic Saline Group	Normal Saline Group	P Value
SBP-min-2, (mmHg)	143.14±25.02	141.77±26.23	0.83
SBP-min-5, (mmHg)	131.62±19.73	127.31±17.45	0.34
SBP-min-10, (mmHg)	119.14±19.68	107.44±14.99	0.017
SBP-min-15, (mmHg)	117.85±24.40	104.81±14.78	0.021
DBP-min-2, (mmHg)	87.70±17.36	86.29±15.72	0.75
DBP-min-5, (mmHg)	78.48±11.22	76.55±12.43	0.55
DBP-min-10, (mmHg)	73.37±11	66.22±11.33	0.022
DBP-min-15, (mmHg)	71.18±18.06	63.96±14.87	0.11
HR-min-2, (b.p.m.)	96.81±16.81	99.07±23.06	0.68
HR-min-5, (b.p.m.)	96.51±16.91	94.37±14.82	0.62
HR-min-10, (b.p.m.)	89.51±14.11	84.55±15.74	0.81
HR-min-15, (b.p.m.)	81.37±13.29	78.25±11.94	0.37
MAP-min-2, (mmHg)	111.11±18.40	102.07±16.84	0.065
MAP-min-5, (mmHg)	100.11±13.58	92±14.23	0.037
MAP-min-10, (mmHg)	91.07±14.34	82.25±11.03	0.014
MAP-min-15, (mmHg)	87.51±19.73	80.03±13.59	0.11

An person with hypertension may suffer significant increases in both their heart rate and blood pressure during the process of inducing general anesthesia, despite the fact that the medicines that are used to generate general anesthesia typically cause hypotension. It is not uncommon for arterial hypotension to occur as a result of the operation after the induction of anesthesia. This randomized experiment was conducted with the intention of determining whether or not intravenous HS administered prior to surgery has the potential to be beneficial for 54 elective surgeries in order to reduce hypotension during the induction of general anesthesia. Following the administration of 2.3 mg/kg of HS 5% before to the commencement of anesthesia, the HS group, which served as the case study, exhibited a

progressive decline in mean arterial pressure (MAP) and heart rate without experiencing any episodes of severe hypotension, as shown by our data. Rebound hypertension is a typical consequence of hypotensive anesthetic procedures that include the use of arterial vasodilators; however, none of the patients in the HS group had rebound hypertension when the HS infusion was stopped.

Because of its function as a vasodilator and its primary advantages, which include the possible regulation of the systemic inflammatory response, a reduction in post-resuscitation sequelae (such as renal failure and coagulopathies), and the lack of cardiac depression, HS was chosen as the treatment of choice. The negative effects of HS on cardiac function are mitigated by the reduction of peripheral vascular resistance, which in turn ensures that the heart continues to circulate blood throughout the body. There is some evidence that HSS may be a beneficial treatment for brain edema and elevated intracranial pressure following head trauma. It has been observed that patients who are experiencing hemorrhagic shock and who have intracranial hemorrhage (IH) and systemic hypotension may benefit from HSS. The researchers examined the effects of 75 mg/ml (7.5%) of HS on extracellular water volume and hematocrit in patients who were having spinal anesthesia. Although there is a paucity of information on how HS impacts hypotension following general anesthesia induction, the researchers looked at how HS influenced these parameters. In situations when an excessive amount of free water is not desired, the findings revealed that HS may be used as an alternative to the common practice of preloading with free water prior to spinal anesthesia.

One of the major risks associated with HS therapy is the development of neurologic complications due to osmotic demyelination syndrome, which is the most hazardous of the potential consequences. Following the administration of HS, there is also the possibility of sudden shifts in the amount of salt present in the blood. In the event that chronic hyponatremia is reversed immediately, the likelihood of the potentially fatal outcome known as central pontine myelinolysis is increased dramatically. Following the first discovery of arterial hypotension that occurred after the rapid infusion of HS, severe hypernatremia as a result of HS has been recorded in a large cohort of emergency patients as well as in a few clinical investigations. Despite the fact that bolus quantities of intravenous HS have not been proved to have any adverse effects, there remains a significant amount of concern in the medical discipline. According to the results of this experiment, none of the two groups had any major adverse effects as a result of receiving intravenous bolus doses of HS. This indicates that there is no reason to reject this treatment option.

Some significant limitations of this study include the fact that it was conducted at a single institution, that the sample size was small, and that there was no blinding. In light of this, it is necessary to conduct more randomised clinical studies on a broad scale that include several sites in order to ascertain the impact that HS has on hypotension after the administration of general anaesthesia.

Conclusion

In the end, the outcomes of this trial revealed that a 30-minute infusion of 2.3 mg/kg of HS 5% half an hour before to the induction of anesthesia resulted in a favorable and progressive decline in mean arterial pressure (MAP) and heart rate, without any episodes of severe hypotension. However, there is a need for further study to be conducted on this strategy.

References

1. Hajjar, I. (2005). Postural blood pressure changes and orthostatic hypotension in the elderly patient: impact of antihypertensive medications. Drugs & aging, 22, 55-68.
2. Shafi, S., & Gentilello, L. (2005). Pre-hospital endotracheal intubation and positive pressure ventilation is associated with hypotension and decreased survival in hypovolemic trauma patients: an analysis of the National Trauma Data Bank. Journal of Trauma and Acute Care Surgery, 59(5), 1140-1147.
3. Hirsch, J., DePalma, G., Tsai, T. T., Sands, L. P., & Leung, J. M. (2015). Impact of intraoperative hypotension and blood pressure fluctuations on early postoperative delirium after non-cardiac surgery. British journal of anaesthesia, 115(3), 418-426.
4. Gharabaghi, A., Koerbel, A., Samii, A., Kaminsky, J., Von Goesseln, H., Tatagiba, M., & Samii, M. (2006). The impact of hypotension due to the trigeminocardiac reflex on auditory function in vestibular schwannoma surgery. Journal of neurosurgery, 104(3), 369-375.
5. Zhou, Y. L., Liu, H. L., Duan, X. F., Yao, Y., Sun, Y., & Liu, Q. (2006). Impact of sodium and ultrafiltration profiling on haemodialysis-related hypotension. Nephrology Dialysis Transplantation, 21(11), 3231-3237.

6. Khan, A. I., Fischer, M., Pedoto, A. C., Seier, K., Tan, K. S., Dalbagni, G., ... & Arslan-Carlon, V. (2020). The impact of pre-induction fluid optimisation on post-induction hypotension. Anaesthesia, 75(5), 634.

7. Rook, W., & Yeung, J. (2018). Pre-operative hypertension and intra-operative hypotension. Anaesthesia, 73(11), 1437-1438.

8. Shoji, T., Tsubakihara, Y., Fujii, M., & Imai, E. (2004). Hemodialysis-associated hypotension as an independent risk factor for two-year mortality in hemodialysis patients. Kidney international, 66(3), 1212-1220.

9. SMITH, S. L., & HALL, E. D. (1996). Mild pre-and posttraumatic hypothermia attenuates blood-brain barrier damage following controlled cortical impact injury in the rat. Journal of neurotrauma, 13(1), 1-9.

10. Choi, Y., Wong, T., & Lau, C. (2004). Midazolam is more likely to cause hypotension than etomidate in emergency department rapid sequence intubation. Emergency medicine journal: EMJ, 21(6), 700.

11. Bagshaw, S. M., Lapinsky, S., Dial, S., Arabi, Y., Dodek, P., Wood, G., ... & Cooperative Antimicrobial Therapy of Septic Shock (CATSS) Database Research Group. (2009). Acute kidney injury in septic shock: clinical outcomes and impact of duration of hypotension prior to initiation of antimicrobial therapy. Intensive care medicine, 35, 871-881.

12. Marmarou, A., Anderson, R. L., Ward, J. D., Choi, S. C., Young, H. F., Eisenberg, H. M., ... & Jane, J. A. (1991). Impact of ICP instability and hypotension on outcome in patients with severe head trauma. Journal of neurosurgery, 75(Supplement), S59-S66.

13. Gebeyehu, G., Daniel, T., Getu, A., & Samuel, H. (2023). A Cross-sectional study on the impact of pre-operative anxiety and associated factors on intraoperative hypotension in women undergoing cesarean section under spinal anesthesia in resource-limited setting.

14. Sands, J. J., Usvyat, L. A., Sullivan, T., Segal, J. H., Zabetakis, P., Kotanko, P., ... & Diaz-Buxo, J. A. (2014). Intradialytic hypotension: frequency, sources of variation and correlation with clinical outcome. Hemodialysis international, 18(2), 415-422.

15. Butwick, A. J., Columb, M. O., & Carvalho, B. (2015). Preventing spinal hypotension during Caesarean delivery: what is the latest?. British Journal of Anaesthesia, 114(2), 183-186.