



## RESEARCH ARTICLE

### CORRELATION OF THE INFERIOR VENA CAVA INDEX AND HEMODYNAMIC STABILITY IN THE TRANSOPERATIVE PERIOD IN THE HIGH SPECIALTY NAVAL GENERAL HOSPITAL

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#### ABSTRACT

**Background:** Fluid management in anesthesiology during the transanesthetic period is of vital importance. It represents a challenge for the anesthesiologist, especially in patients who are not hemodynamically stable.

**Objective:** To report the correlation between the vena cava collapsibility index and the hemodynamic stability of patients under general anesthesia during the transoperative period

**Methods:** The data were coded and stored in the Microsoft Excel software and analyzed using the SPSS version 17 software. The statistical significance was defined as a P value <0.05. Frequency, central tendency and dispersion measures were used. To assess the correlation of the numerical variables (Bleeding and VCI) the Pearson linear correlation coefficient test was used. The coefficient of determination was calculated, and for the association of qualitative variables, the  $\chi^2$  test was used. A p less than 0.05 was considered significant, with a confidence level of 95% and an alpha error of 5.

**Conclusions:** In this study it can be determined that it is important to use ultrasound for fluid control in anesthesiology.

#### INTRODUCTION

Water resuscitation and hemodynamic stability is one of the main objectives of the anesthesiologist within the operating room; if it is done properly, it can be deleterious to the patient and this was described in a study conducted in 2004, where cardiac arrest occurred at 4.38 / 10,000 anesthetic events with the death of 6.38 / 10,000 anesthetic events at 30 days after critical intraoperative event. Hemorrhage was responsible for 33% of the events of cardiac arrest and 47% of deaths, two thirds of deaths attributed to bleeding occurred in emergency surgical situations, one third of these occurred in elective surgical procedures, hence part the anesthesiologist's concern to perform an adequate resuscitation, however, for many years the evaluation of the administration of intravenous fluids has been carried out indirectly through techniques. Poor resuscitation with scarce fluids can lead to tissue hypo perfusion and worsen organ dysfunction; however, over-resuscitation with excess fluid prescription also seems to impede oxygen delivery and compromise the patient's evolution. Irreversible damage to glycocalyx. Currently, several hemodynamic markers are available to determine the response to intravascular volume administration, however, one of the most studied at present is the inferior vena cava collapsibility index, its use improves efficiency with which the volume is replenished in the patient, avoiding states of hypovolemia or hypervolemia, improving the prognosis and decreasing morbidity and mortality.

All of the above points to the need to have an intraoperative system for more precise assessment of the needs of fluids, especially in cases of long surgeries or patients with associated pathology.

#### MATERIALS AND METODOS

During the period from June 1, 2016 to June 1, 2017, in the present study, 40 patients over 18 years of age scheduled for elective surgery under balanced general anesthesia were selected, none of them were excluded. We identified patients who met the selection criteria to participate in the study from the external anesthesiology consultation. It was explained in detail what the ultrasound measurement of the vena cava index and its benefits consists of, they were invited to participate, and upon accepting they signed the informed consent. Once the patient was in the dorsal decubitus position, monitored and intubated, the first measurement of the inferior vena cava was made and the first data recordings of the monitor were taken to capture the data. The subxiphoid window was located, placing the transducer immediately below and slightly to the right of the xiphoid appendix, directing the transducer to the left shoulder with a depth of 16-20 cm or greater, in order to locate the heart, to make a turn continuous anticlockwise of the transducer from 3 to 12 and shift to the left. Realizing the movements of the transducer described, the vena cava was seen in its path through the liver. Once the vena cava was located, the measurement was made in mode M. This measurement was made twice, when the surgery was started and at the end of the surgery it was reported in the data

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collection sheet. The present study was approved by the Ethics and Local Research Committee.

**Statistic analysis**

The description of the sample was carried out using descriptive statistics with measures of central trend and dispersion, as well as frequency counting, proportions and percentages. For the bivariate and multivariate analysis, inferential statistics were applied, including analysis of variance of one and two factors to compare means and to evaluate the interactions; the Chi square test was applied to compare ratios and Student's t-test to compare two averages of samples with normal distribution. A p equal to or less than 0.05 was considered significant to reject null hypotheses. The data were analyzed with the SPSS package ver 17.0 for Windows, with a significance value of  $p < 0.05$ .

**RESULTS**

We recruited 27 male patients and 13 female patients, which corresponds to 37.5% female population and 62.5% with an average age of  $43.15 \pm 10.82$  who presented an initial heart rate of  $72.25 \pm 11.34$  bpm, an initial saturation of  $97.97 \pm 1.32$ , on the other hand we have that of the solutions that were used prevailed the solution Hartmann with 70% and the NaCl at 09.% with 30%, as for the ventilatory parameter called tidal volume was maintained with  $456 \text{ ml} \pm 34.3$ , the water balance that represents the income and expenses of the amount of liquids of the patients was  $252 \text{ ml} \pm 156$ .

The initial mean arterial pressure was  $79.05 \pm 11.93$  mmHg According to the classification of the physical state of the patients: 25 patients were ASA 1 and 15 were ASA 2 represented in percentages on graph 2. Graph number 3 shows us the distribution in percentages of how the index of variability of vena cava classified in levels in patients before the surgery behaved with a result of 62.5% came out normal, only 15% had an index that corresponded to be collapsible and the rest that represent 22.5% were not colpasables. According to the statistical analysis carried out the initial variables such as heart rate, partial oxygen saturation, and mean arterial blood pressure, there is no correlation with statistical significance, so no change can be attributed to this neither positive nor negative. This is shown in the correlation tables with their P greater than 0.05 in all those variables.

**DISCUSION**

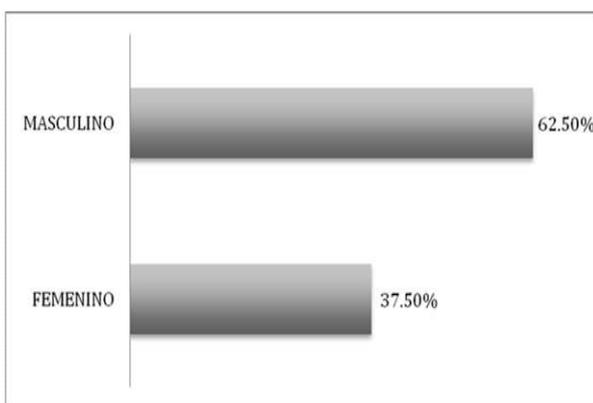
For the moment the results obtained should be made in other physical states such as ASA 3 and 4 with a larger sample size since this type of patients therefore already have hemodynamic changes according to their pathology and it would be deleterious to carry out a poor fluid handling, Nowadays, the objective evaluation of the response to fluid management in patients and in decision making should be adequate to the initial therapeutic approach, which represents a challenge in all operating rooms in Mexico and the world, which is even more important due to the report of increased mortality associated with excessive fluid overload;

**Table 1. Correlation between IVC1 and hemodynamic stability variables**

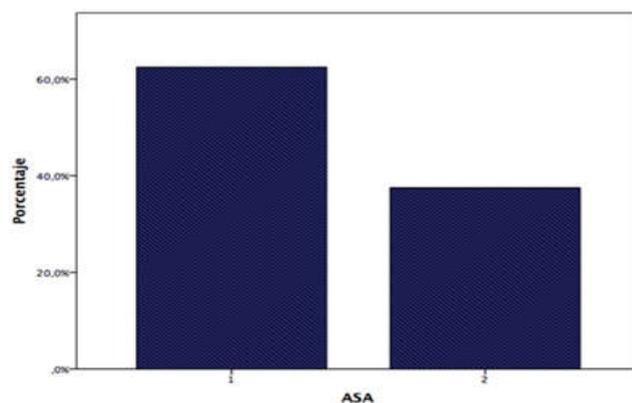
CORRELACION IVC1 Y SPO21		IVC1	SPO2
IVC1	Coefficiente de correlación	1,000	-,113
	Sig. (bilateral)	.	.
SPO2	Coefficiente de correlación	-,113	1
1	Sig. (bilateral)	,487	.

**Table 2. Correlation between IVC1 and hemodynamic stability variables**

		IVC22	Diure	VCT	PEEP	IMC	TQX	CANT.	EDAD	SANGr
IVC22	Correlación de Pearson	1	-,089	,144	,195	,143	,029	-,205	-,227	-,029
	Sig. (bilateral)		,586	,375	,227	,380	-,035*	-,023	,160	-,016



**Figure 1. Characteristics by gender of the population**



**Figure 2. Physical condition of patients**

Although in this study it was not possible to demonstrate the correlation between the variability of the vena cava index and the hemodynamic stability, more accurate and non-invasive methods must be sought in order to replenish the fluids. In this study it was not possible to determine the correlation of the vena cava index at the beginning of the surgery or at the end of it with the hemodynamic variables to evaluate the blood volume, however we found a correlation between secondary variables but they are not strong enough so that are the only determinants for the administration of liquids. The compliance of the IVC is a reliable noninvasive study that offers us greater security in the care of the patient in critical condition, so we must learn to use it and implement it in the operating room.

## DECLARATIONS

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The present study was approved by the Ethics and Local Research Committee.

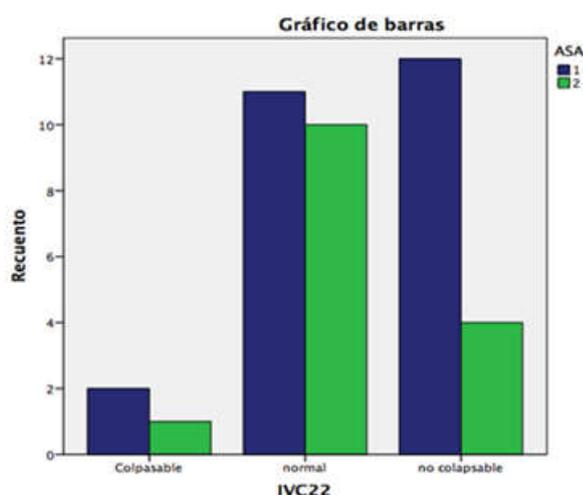


Figure 3. Graph of percentage of variance of vena cava

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