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PATHOGENETIC CHANGES OF HEMODYNAMIC INDICATORS AT THE EMERGENCY CESARIAN SECTION IN THE MAIN STAGES OF SURGERY

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Abstract

Many authors note the fact of increasing the number of cesarean sections during childbirth. In recent decades, only in Ukraine, this figure has risen from 9.88% in 1999 to 18 – 25% today. In general, the issue of blood loss remains very important issue in obstetrics and gyn ecology. During operative delivery by cesarean section the risk of intraoperative bleeding increases 4 times.

The aim: to analyze pathogenetic changes in systolic and diastolic blood pressure, the amount of hemoglobin in the peripheral blood at the main stages of emergency cesarean section. All data should be analyzed for the Algover shock index. Since the conclusions show the ratio of protocol blood loss (determined by Libov) to the shock index and hemoglobin in blood plasma.

It was established that hemodynamic parameters have small diagnostic ability to determine the amount of blood loss, due to the high compensatory capacity of young mothers. Accordingly, the Algover shock index also has a small informative capacity, which is specified in paragraph 1. The next problem of the shock index is the inability to verify bleeding up to 10 % of blood volume deficiency. This makes the method unreliable during controlled intraoperative blood loss. Also, the diagnostic method is criticized on the basis of small variation of the sizes of bleedings. In fact, the method has only 4 variants of bleeding. It is this factor that makes it ineffective to determine the exact amount of blood loss, and subsequently pathogenetic treatment. The method of determining the amount of blood loss based on the amount of hemoglobin in the peripheral blood is also not very informative during surgical delivery. Causes: low sensitivity to bleeding during surgery and centralization of blood circulation in the mother.

All human studies were conducted in compliance with the rules of the Helsinki Declaration of the World Medical Association "Ethical principles of medical research with human participation as an object of study". Informed consent was obtained from all participants.

Keywords: *loss, cesarean section, Algover shock index, hemodynamics, hematology*

Introduction

Many authors note the fact of increasing the number of cesarean sections during childbirth [1, 2, 3]. In recent decades, only in Ukraine, this figure has risen from 9.88% in 1999 to 18 – 25% today [4].

Many authors attribute this to the intensive development of medicine. For example, it is anesthesia and of surgical surgery [5]. That is why, there is global trend to increase the frequency of operative delivery compared to vaginal delivery.

The issue of blood loss remains very important problem in obstetric and gynecological care [6]. And during operative delivery by cesarean section the risk of intraoperative bleeding increases in 4 times [7].

By these facts, systems for the diagnosis of bleeding during surgical delivery are extremely needed. Focusing on the growing number of cesarean sections, the situation is only increasing.

To assess the amount of blood loss, indicators of systolic, diastolic blood pressure, pulse are taken into account. Than calculate the Algover shock index [8]. Also use the method of determining the hemoglobin concentration in the peripheral blood [9].

The aim of work is to analyze pathogenetic changes in systolic and diastolic blood pressure, the amount of hemoglobin in the peripheral blood at the main stages of emergency cesarean section. All information should be analyzed for the Algover shock index. As the conclusions show the ratio of protocol blood loss (determined by Libov) to the shock index and hemoglobin in blood plasma.

Methods

The study was conducted on the basis of the maternity and gynecological department of the hospital. The study included mothers with full-term pregnancies who were delivered by cesarean section.

The group of mothers was selected in the period from November 2017 to November 2018. All women in labor were included in the study. The fact of inclusion was the presence of childbirth by cesarean section.

All patients at the time of admission to the department had a full-term pregnancy and no somatic pathology. Indications for operative delivery, in all cases, were from the mother.

At the inpatient stage, pregnant women were examined according to the order of the Ministry of Health of Ukraine № 620 from December 29, 2003 "About the organization of inpatient obstetric and gynecological and neonatological care". Indications for surgery were determined on the basis of the order of the Ministry of Health of Ukraine № 977 from 27.12.2011 "About amendments to the order of the Ministry of Health of Ukraine from 15.12.2003 № 582 "About approval of clinical protocols for obstetric and gynecological care".

The lower transverse laparotomy according to Pfanenshtil was chosen as the operative approach. Hematological and hemodynamic parameters were measured before surgery. The skin, subcutaneous fat, aponeurosis and parietal peritoneum were dissected separately in layers.

The incision on the uterus was made according to Gusakov. Than the removal of the fetus from the uterine cavity with the subsequent birth of the placenta. The final stages of surgery were layered suturing of the uterus, parietal peritoneum, rectus abdominis, aponeurosis, subcutaneous fat, and skin. At each stage, hemostasis control.

We divided all women in the study into two groups. The 1st group included women in labor in which the indication for surgical delivery was not related to changes in hemostasis and preoperative bleeding. Of course, the 2nd group included mothers who had indications for surgical delivery that affected the hemostasis system and had preoperative bleeding.

The average age of patients was 25.9±3.5 years. The average duration of operative delivery is 43.2±1.2 minutes.

All parameters (systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse, hemoglobin concentration in peripheral blood, Algover shock index) were evaluated at the preoperative stage, after laparotomy, and after surgery.

Results

The total number of mothers – 29. 23 women (79.3 %) were performed an emergency cesarean section, and the 6 women (20.7%) planed caesarean section. In 3 patients (10.3 %) indications to the cesarean section were - detachment of the normally

located placenta, 26 women (89.7 %) indications did not relate to changes in hematological parameters.

In 20.7 % patients the dominant indication was a scar on the uterus after cesarean section, refusal of vaginal delivery. In these cases, the scar on the uterus was formed and without defects on ultrasound control, and intraoperatively.

In 89.7 % women had no preoperative hematological and hemodynamic changes. And pre-surgical bleeding was observed in 10.3 % of patients.

In emergencies, there were two urgent indications: clinically narrow pelvis – 69 %, detachment of the normally located placenta – 10.3 %.

In women in labor who developed detachment of the normally located placenta in 6.9 % there was a slight bleeding in the first period of childbirth, in 3.4 % blood loss reached - 100.0-150.0 ml.

The determination of values of systolic (SBP) and diastolic blood pressure established that the SBP in group 1 was decreased on 4.1 mm Hg after laparotomy, on the end of surgery it increased on 0.2 mm Hg. In this way, SBP in group 1 during the period of childbirth decreased on 3.9 mm Hg (3.54 %) (Fig.1).

In women in group 2 at the end of laparotomy SBP decreased on 7.3 mm Hg, and on the end of surgery increased on 4.8 mm Hg. So for all operative delivery the indicator decreased on 2,5 mm Hg (2,26 %).

SBP in both cases decreased. In group 2 were determinate lower percentage decrease in the parameter compared to group 1 on 1.28 %.

In group 1, the hemodynamic index initially decreased on 5.8 mm Hg, but then increased on 0.4 mm Hg. Since the operation, the decrease in DBP has occurred on 5.4 mm Hg (7.19 %).

In the group 2 there is also decrease in DBP on 1.8 mm Hg, further increased on 0.1 mm Hg. In general, during childbirth DBP decreased on 1.7 mm Hg (2.27 %).

The similar situation develops in the analysis of DBP. In both cases, the hemodynamic index decreased. In the group 1 increasing on 4.92 %. When comparing groups: SBP – 3.54 % and 2.26 %; DBP – 7.19 % and 2.27 %.

The Algover's shock index is determined by the ratio of the pulse of the SBP.

From fig. 2 it is found that the average value of the shock index before surgery is still at the level of 0.68. After laparotomy in group 1 no changes are observed, that is until the moment of intraoperative blood loss. By the end of surgery, the index rose on 0.02 (2.94 %).

In group 2 already at the stage of laparotomy the index increased on 0.1 (14.71 %). Then, after eliminating the source of bleeding, the rate decreased on 0.04 (5.88%). Thus, during the period of surgical intervention in group 2, the Algover index increased on 0.06 (8.82 %).

When comparing the two groups, there is an increase in the Algover shock index in both cases. Clearly visualized increase in the indicator in group 1 after laparotomy, and in the group 2 increase before laparotomy with subsequent stabilization.

Thus, in the group 1 the value increased on 2.94 %, in the second group - 8.82 %. Therefore, when the value of the index in the group 2 is higher on 5.88% compared to the group 1.

The mathematical calculation of the graph clearly shows the decline in hemoglobin in the group 1 from 96.1 g/l to 96 g/l. Subsequently, the hemoglobin level did not decrease (Fig. 3).

The situation in the group 2 was the same. By the end of the laparotomy, hemoglobin in plasma decreased on 0.2 g/l. By the end of surgery, the blood count decreased on 0.1 g/l. It becomes possible to draw a conclusion about insignificant deviations in both groups.

The calculations of blood loss are paradoxical (fig. 4). Actual blood loss was an indicator of the protocols of surgery. There were only two indicators, namely before surgery and after surgery. The intermediate fact was not specified in the protocols.

Calculated blood loss was up to 10 % of BV deficit at all stages and in both groups. That is, up to the level of 753 ml. This method does not accurately determine the size of blood loss due to low fluctuations of all components and the slight severity of the general condition of women in relation to the development of hemorrhagic shock.

Discussion

At the analysis of arterial pressure changes it is higher indicators in groups with preoperative bleeding are traced, at the beginning of an

operative measure. In our opinion, this phenomenon is explained by the young age of mothers and high compensatory capacity. These possibilities are manifested in the functioning of the sympathoadrenal system and aldosterone-renin-angiotensin system. Therefore, it is impossible to judge the size of preoperative blood loss in these cases.

During the entire period of surgery, according to the generally accepted provisions, blood pressure levels should have been lower than in groups with intraoperative bleeding. This clinical situation is complicated by anesthesia-controlled hypotension during surgery. However, in the study there are not significantly high levels of discrepancy in hemodynamics. That is, in this clinical situation, the size of hemodynamics does not significantly affect the amount of blood loss with subsequent assessment of the general condition.

It would be logical to consider, in the further change, Algover's shock index. Since part of the indicator is systolic blood pressure. The first problem with this indicator is the inability to establish the amount of blood loss up to 10 % of the BV deficit.

The study clearly shows the similarity of values in both groups before surgery. Although in the group 2 there was preoperative bleeding, which in turn affects all indicators.

Subsequently, in group 1, according to the shock index, the fact of intraoperative blood loss was leveled, although the protocol amount of blood loss was entered on the basis of bleeding verification.

The group 2 began to stand out against the first only after laparotomy. Although it is necessary to mention the anesthesia-controlled hypotension. Therefore, these data are of little informativeness for setting the amount of blood loss both before and after postoperative bleeding.

Hemoglobin levels in peripheral blood are also used to calculate blood loss. Although it should be noted that the metabolism of hemoglobin is much longer than all pathogenetic changes in the body.

The study shows that changes in the amount of hemoglobin in the group 1 are larger in quantitative terms, but not in percentage. The percentage comparison is much more reliable, as the initial data in the groups were different. No less important is the presence of preoperative bleeding, which causes systemic vasoconstriction and centralization of blood circulation. Therefore, the amount of blood, mainly with erythrocytes and not with regenerative forms of their form.

Conclusions

1. Hemodynamic parameters have small diagnostic ability to determine the amount of blood loss, due to the high compensatory capacity of young mothers.
2. Accordingly, the Algover shock index also has a small informative capacity, which is specified in paragraph 1.
3. The next problem of the shock index is the inability to verify bleeding up to 10 % of blood volume deficiency. This makes the method unreliable during controlled intraoperative blood loss.
4. Also, the diagnostic method is criticized on the basis of small variation of the sizes of bleedings. In fact, the method has only 4 variants of bleeding. It is this factor that makes it ineffective to determine the exact amount of blood loss, and subsequently pathogenetic treatment.

The method of determining the amount of blood loss based on the amount of hemoglobin in the peripheral blood is also not very informative during surgical delivery. Causes: low sensitivity to bleeding during surgery and centralization of blood circulation in the mother.

Acknowledgments

The authors declare that there are no conflicts of interest.

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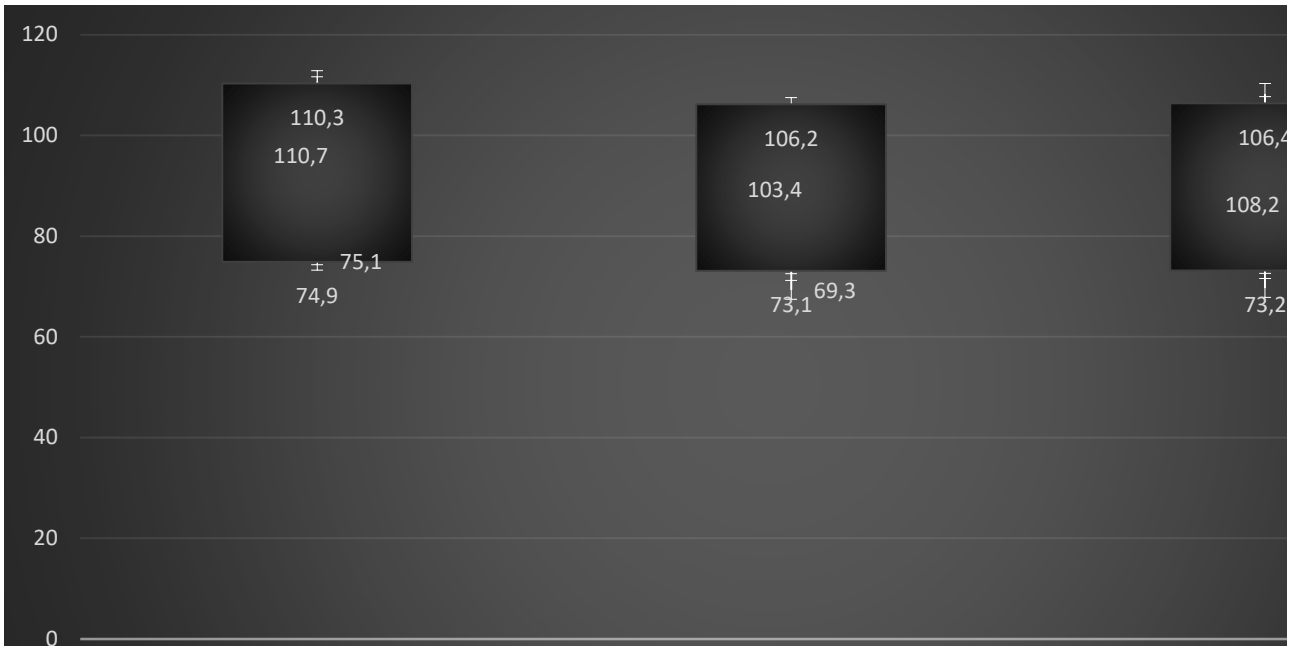

Figure 1. Values of systolic (SBP) and diastolic blood pressure, at p<0,05.

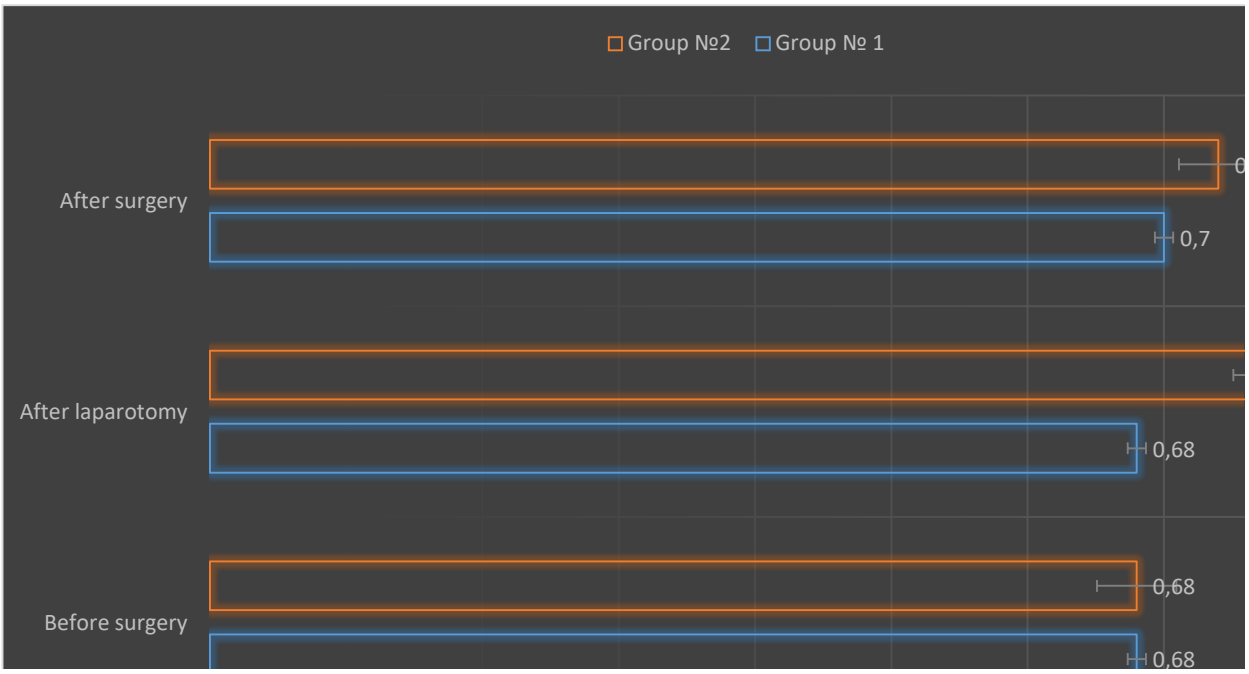

Figure 2. The value of the shock index according to Algover, p<0,05.

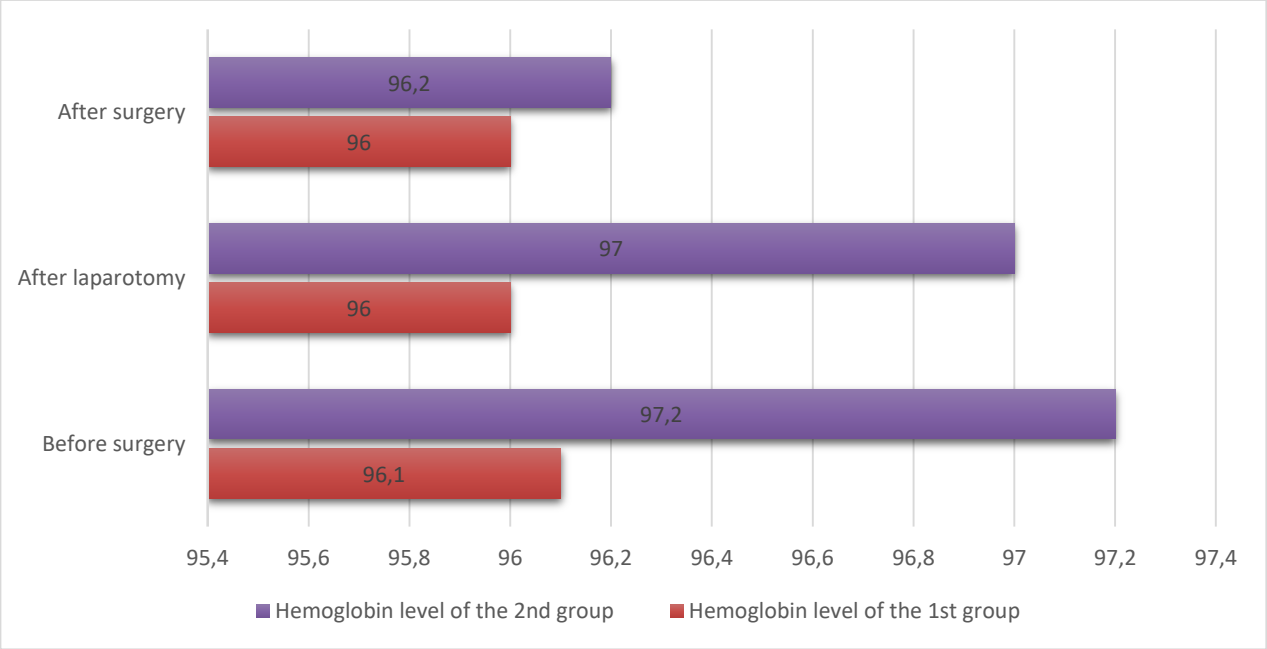

Figure 3. Change in hemoglobin in plasma in women in labor, g/l. (p<0.05)

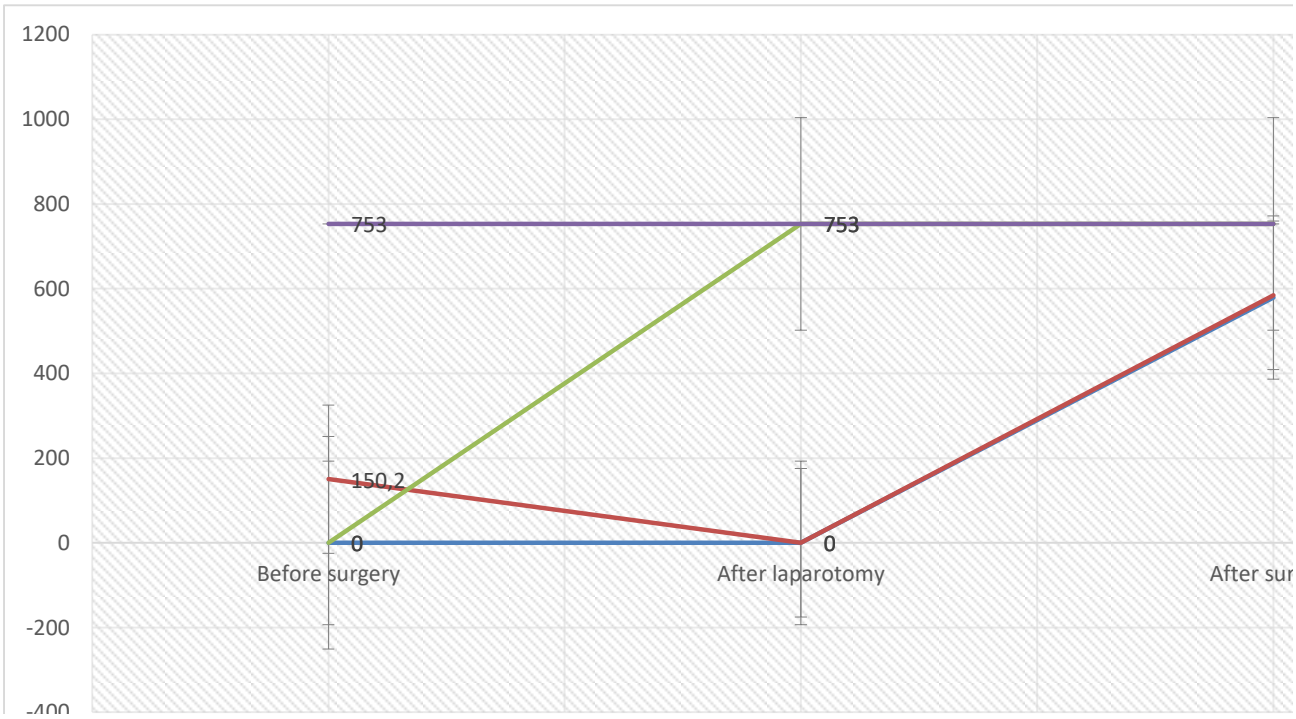

Figure 4. The ratio of actual and estimated blood loss, ml.