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## COMPARATIVE ANALYSIS OF MODERN METHODS OF ABORTION IN THE FIRST TRIMESTER OF PREGNANCY: MIFEPRISTONE AND MISOPROSTOL AND VACUUM ASPIRATION

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**Abstract:** Over the years, numerous methods of termination of pregnancy have been used, which are characterized by varying degrees of invasiveness, duration, success and safety. Two procedures are most often used: surgical - dilation of the cervical canal channels of fetal evacuation using vacuum aspiration and abortion, and medical-with Mifepristone and Misoprostol.

Termination of pregnancy in the second trimester is only 10.0% - 15.0% of all induced abortions, but this manipulation is associated with 2/3 of the complications of all abortions. For Bulgaria, there are no statistics of aborted pregnancies by gestational age. They are represented in the group of abortions for medical reasons. The National Center for Public Health and Analysis (NCPHA) provides information about abortions for medical reasons without specifying the duration of pregnancy.

The purpose of this study, in which a comparative analysis of 4 groups of patients was presented: 2 groups of 140 abortions for the first trimester with medical and surgical abortion and 2 groups of 70 abortions for the second trimester of pregnancy with medical abortion and dilation and evacuation. The analysis of post-abortion results makes it possible to assess the risks and benefits of using modern methods of abortion, measure the effectiveness and improve individual obstetric and gynecological practice. Medical abortion in the first and second trimester has a high efficiency (91.4-95.7% of completed abortion) and safety, requiring a time of expulsion of the uterine contents - on average 7 hours (I trimester) - 8 hours (second trimester).

The effectiveness of vacuum aspiration in the trimester is high-97.1% of completed abortion, incomplete abortion 0.7%. This is a fast (15 minutes) and safe procedure.

**Keywords:** termination of pregnancy, medical abortion, vacuum aspiration, safety, efficiency.

### 1. INTRODUCTION

Termination of pregnancy is the most common gynecological procedure. Globally, more than 56 million abortions are performed annually, 88.0% of them are in developing countries. The definition of abortion states that an abortion (abortion) is a spontaneous or artificial termination of pregnancy until the end of the 22g.a. or the weight of the fetus is below 600 g. Termination of pregnancy in the second trimester is an induced abortion after 12 g.a.

Globally, 90.0% of induced abortions are performed during the first trimester. Abortions in the second quarter accounted for 10.0% -15% of all abortions [1,2,5,8]. An increasing number of these late abortions are associated with the early detection of fetal malformations or chromosomal abnormalities [13,16,17]. Carrying out an abortion should not contradict the law and be safe. In Bulgaria, in the decree 2 of the Ministry of Health of 01.02.1990. the conditions and procedure for artificial termination of pregnancy were determined [7].

Any pregnancy can end in 3 ways: with childbirth, with a miscarriage, with an artificial abortion. There are three types of artificial abortions: optional, for medical reasons, and unregulated (criminal). The gestational age of the fetus determines the method of choice for termination of pregnancy.

Methods of termination of pregnancy in the first trimester [15]:

- Surgical methods [9]: vacuum aspiration, dilation and curettage
- Medicinal methods [10,11]: prostaglandins; antiprogesterone;

Methods of termination of pregnancy in the second trimester:

- Surgical methods [4] : dilation and evacuation; hysterotomy; hysterectomy
- Medicinal methods [6]: hypertonic sodium chloride solution; concentrated glucose solution; urea; rivanol; oxytocin; prostaglandins; antiprogesterone;
- Mechanical induction means: Bougie (from the French bougie); Metreinter (d - + euryno); bubble catheter.

The historical review of the use of abortion methods, along with their advantages and disadvantages, surgical methods and therapeutic schemes, is presented in detail in the study of A. Andreev in 2016 [3].

The National Center for Public Health and Analysis (NCPHA [14]) provides information on abortions on medical reasons, without specifying the gestational age of the fetus. The percentage of abortions by medical indications in the second trimester remains unknown. Abortion must not be against the law and must be performed safely [12]. In Bulgaria, Ordinance №2 of the Ministry of Health on the 01.02.1990 defines the terms and conditions for abortion [18,19]. In Ordinance № 9 on April 27, 2021 on the approval of the medical standard „Obstetrics and Gynecology“, issued by the Minister of Health Prom. DV. issue 41 of 18 May 2021, amended DV. No. 63 of July 30,2021 the instructions and criteria for pregnancy termination due to medical reasons are regulated.

## 2. RESULTS AND DISCUSSION

**The subject of the study** is the conduct of medical and surgical abortion in the second trimester of pregnancy in two main medical institutions in the city of Varna (SHOGAT „Prof. Dr. al. Stamatov”and MHAT „St. Anna”). **The object of the study** was pregnant women with indications for termination of pregnancy.

**Sample formation:** for the period from 2013 to 2018 in SHOGAT „Prof. Dr. al. Stamatov” - Varna and MHAL „Saint Anna” - Varna are carried out with 2590 medical and surgical abortions during the second and second trimesters (MA, VA). Patients were selected based on whether they had an induced abortion during the first or second trimester, as well as depending on the type of abortion-MA or VA . Two pairs of groups are formed-for the second trimester (MA, VA), for the second trimester (MA, D&E). With the indicator-the ratio of chances (relative risk) (Odds Ratio – OR), the strength of the impact of the research factor - the type of abortion is measured. The measurement of the exposure and the result takes place at different times.

The study is based on an epidemiological approach and is experimental-theoretical. Before collecting data at the research object – in patients with pregnancy in the I and II trimester, has a direct impact. The study is retrospective and prospective in nature. According to the type of epidemiological study, it is an observational, analytical-cohort type. There was a natural development of the studied phenomena – the manifestation of early and late complications after exposure-termination of pregnancy by medication or surgery, MA and VA (VA, D&E). The frequency is determined and the mutual relationships between the use of the method of termination of pregnancy and the subsequent effect of complications are analyzed.

From the literature data, it was found that the estimate of the relative share in the total population for the parameter-completed abortion (selected as the main one) is at least 87.0%. With a confidence probability of  $p=0.05$  (95.00%), a confidence probability coefficient of  $z = 1.96$ , the maximum allowable margin of error of  $\Delta p=3.0\%$  and the total population volume of  $N=2590$ , the sample size of 420 abortions randomized in four cohorts, two for each trimester, is calculated using the sample size formula to estimate the relative proportion: 140 MA I/ 140 VA; 70 MAII/ 70 D&E.

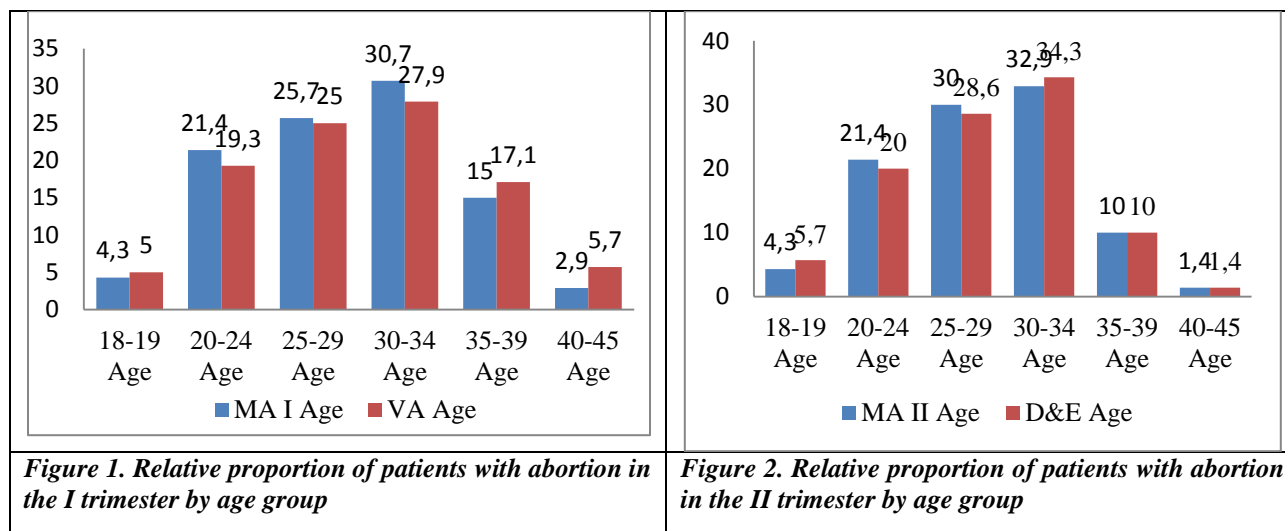
The groups were compared according to the age of the patients, the gestational week in which the abortion was performed, parity, the method of birth (PN, SC), the history of previous abortion and the number of abortions, the history of previous vaginal infection and indications for termination of pregnancy (optional and from a medical point of view). The structure of the matched groups for both trimesters is approximately the same. All manipulations related to abortion are performed in accordance with the principles of informed consent after a detailed explanation.

**Distribution by age.** The calendar age of patients is the first sign of the standardization of the four groups in pairs for the first and second trimesters. The average age in both trimester groups was 29 years, and for the second trimester - 28.5 years (Table 1). Women from 18 to 45 years were included in four groups, and the distributions by age groups were shown graphically in Figures 1 and 2.

**Table 1. Frequency allocation of patients by age with abortion in the second trimester**

Age	Quantity	Minimum	Maximum	Average (Age)	Standard deviation
*MA I trimester	140	18	44	29,05	5,868
*VA	140	18	45	29,69	6,529
**MA II trimester	70	18	42	28,61	5,616
**D&E	70	18	44	28,53	5,768

(\*MA I - medical abortion, I trimester, VA-vacuum aspiration; \*\*MA II - medical abortion, II trimester, D & E-dilation and evacuation)



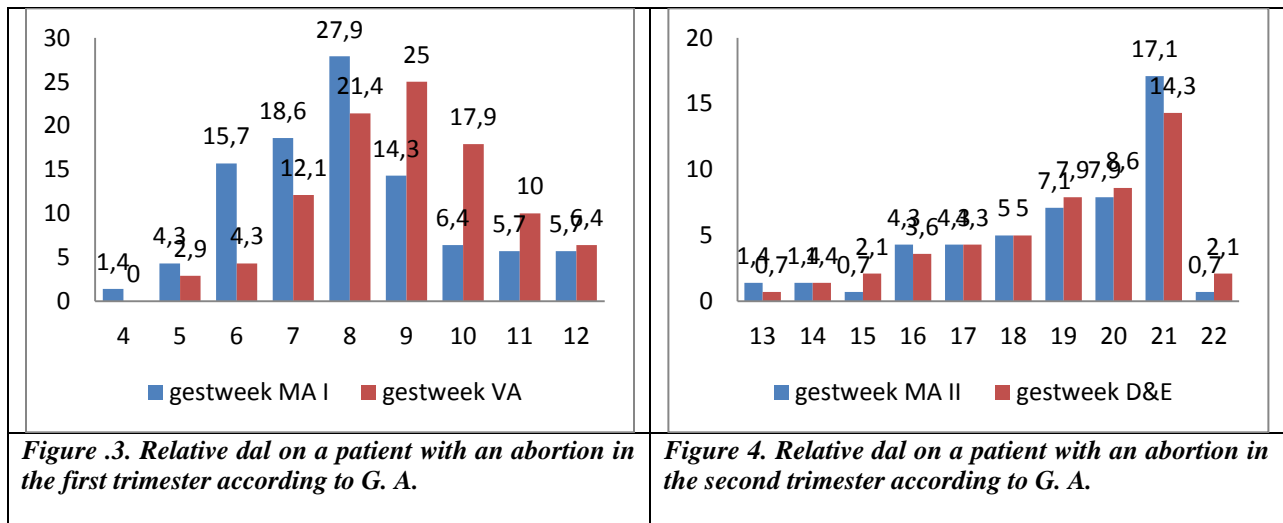
The relative units of the patient by age groups in both the first and second trimester were close, as in any trimester of the patient groups aged from 30 ages to 34 ades, the largest.

**Distribution by gestation period.** The gestational period of pregnancy is the second sign that the four groups were standardized by pairs for the first and second trimesters. The average G. A. in both groups of the average age was about 8 g.a for MA and 9 g.a. for VA, and for the second trimester - 19 g.a. for MA and D & E (Table 2).

**Table 2. Frequency distributions of patients by gestational age in the groups of abortions in the third trimester**

Gestational age	Quantity	Minimum	Maximum	Average (Age)	Standard deviation
g.a MA I	140	4	12	7,99	1,811
g.a VA	140	5	12	8,87	1,644
g.a MA II	70	13	22	18,99	2,216
g.a. D&E	70	13	22	18,99	2,184

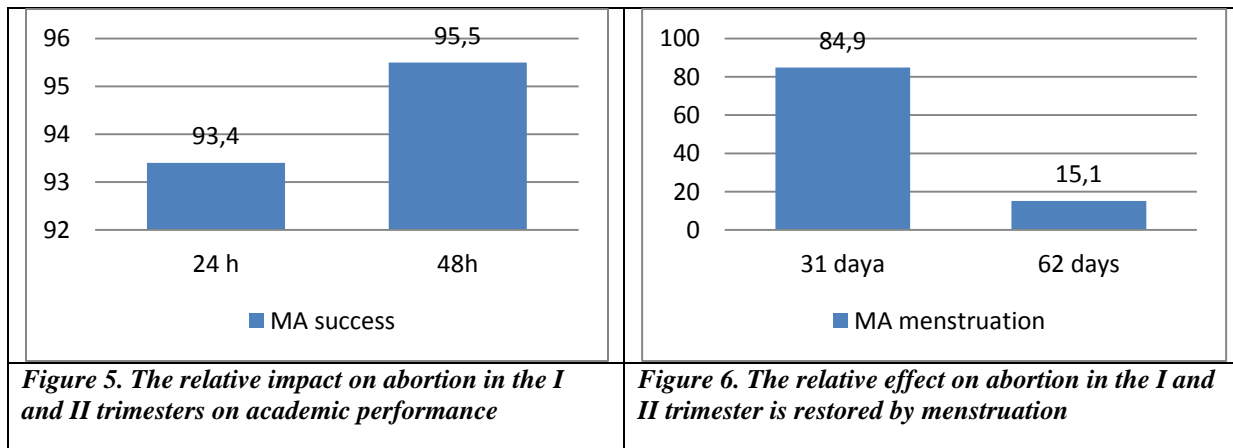
The size proportions of patients according to g. a. are shown graphically (Figure 2 and 3).



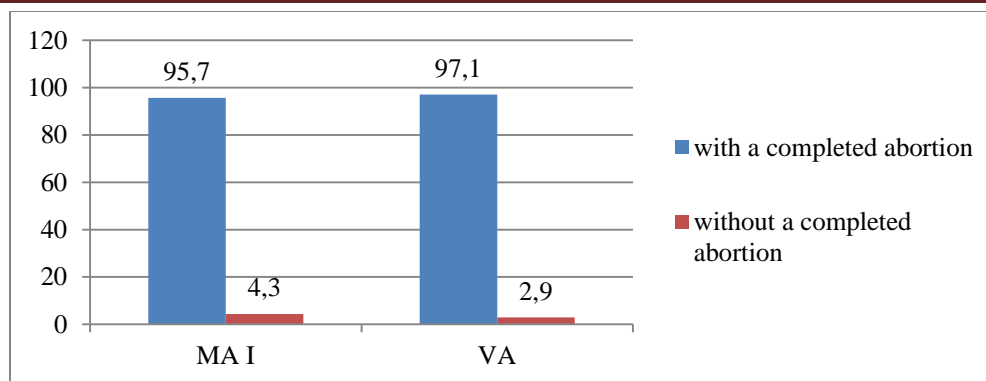
The relative proportions of patients according to G. A. in both the first and second trimester are close. In I trimester, in the group MA in 8 g.a. this is the largest (27, 9%), and in VA – 9 g.a (25.0%). In the second trimester, both MA (17.1%) and D&E (14.3%) patients with 21 g.a. are with the largest relative share.

**3. SAFETY, EFFECTIVENESS, SUCCESS INDICATORS, MENSTRUAL CYCLE DISORDERS**

MA in the I and II trimesters is a safe procedure. In the studied groups, there were no cases of death, as well as complications-damage to the cervical canal, damage to the uterus, ongoing pregnancy and an allergic reaction. On average, for both trimesters, MA was completed within 24 hours at 93.4% of the patients (185 out of 198 abortions were completed), and at 95.5% (189 out of 198 abortions were completed) within 48 hours. In 84.9% (168 out of 198 abortions were completed) of patients with a ready-made MA and menstruation was restored within 31 days, and in 15.1% (30 out of 198 abortions were completed) - within 62 days (Figure. 5 and 6).



**Efficiency - completed abortion (abortus completus).** *Relative chance of a completed abortion:* Using Chi-Square (chi-square) analysis, it was found that there is no significant causal relationship between the method of termination of pregnancy (MA, VA) and the presence of a completed abortion (Sig. 2-side>0.05), point. there is no difference between the two methods and they have the same efficiency. In the MA group, the relative proportion of cases of completed abortion was 95.7%, (134 abortions), and in the VA – is group 97.1%, (136 abortions), so well. the two sections are approximately the same (figure 7). The relative risk (OR) for a completed abortion is < 1.0, so the type of method (MA, VA) is not a risk factor (OddsRatio 0.657).



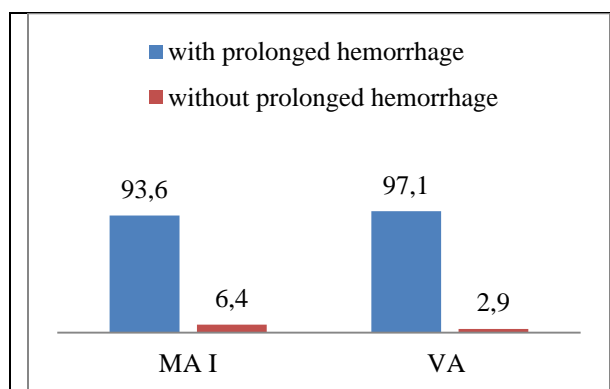
**Figure 7. Relative proportion of patients with MA and VA with and without an abortion**

Dispatch time: For a weighted average value is 7.1 hours, a minimum of 4 hours and a maximum of 12 hours. For VA - the weighted average value is 15 minutes, the minimum is 10 minutes and the maximum is 20 minutes.

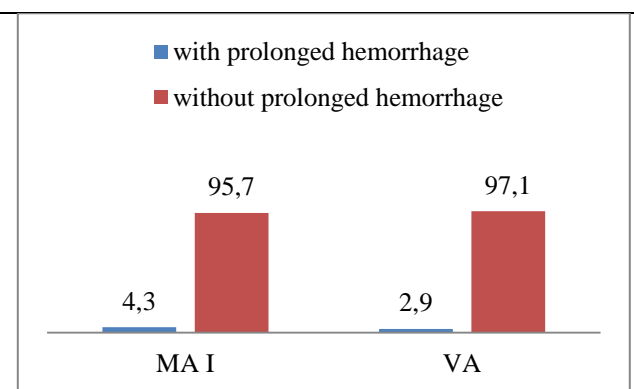
#### 4. EARLY COMPLICATIONS OF ABORTION IN THE TRIMESTER OF PREGNANCY

**Hemorrhagia persistens.** *Relative risk of prolonged hemorrhage:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA, VA) and the appearance of prolonged hemorrhage, but it is not statistically significant due to the small number of cases of hemorrhage (Sig.2-sided>0.05). In the group with MA, the relative proportion of cases with prolonged hemorrhage was 6.4%, (9 abortions), and in the group with VA – is 2, 9%, (4 abortions), so well. 2.2 times more (figure 19).The relative risk (OR) of prolonged hemorrhage was 2.3 times higher in the group with MA (Oddsratio2. 336).

**Intensive hemorrhage.** *The relative risk of intensive bleeding:* Using Chi-square (Chi-Square) analysis, it was discovered that between the method of abortion (MA ,VA) and the emergence of intense hemorrhage there is a causal relationship, but it is not statistically significant due to the small number of cases, hemorrhage (Sig.2-sided>0.05). In the group with MA, the relative proportion of cases with intense bleeding was 4.3% (6 of abortions), and in the group with VA – is 2, 9%, (4аборта), so well. 1.5 times more (figure 20).The relative risk (OR) of the appearance of intense chemoragia is 1.5 times higher in the group with MA (OddsRatio 1.522).



**Figure 8. Relative proportion of patients with MA and Va, with and without prolonged hemorrhage**

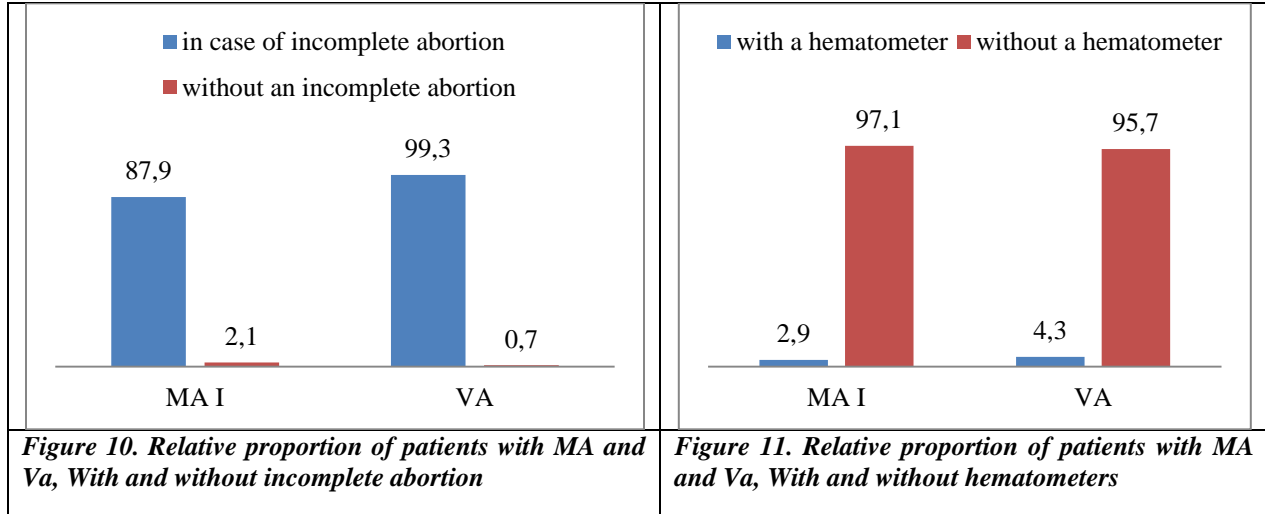


**Figure 9. Relative proportion of patients with MA and Va, With and without intensive hemorrhage**

**Abortus incompletes.** *The relative risk of incomplete abortion:* Using Chi-Square (Chi-square) analysis, it was discovered that between the method of abortion (MA ,VA) and the appearance of incomplete abortion there is a causal relationship, but it is not statistically significant due to the small number of cases of incomplete abortion (Sig.2-sided>0.05). In the MA group, the relative proportion of cases of incomplete abortion was 2.1% (3 of abortion), and in group VA – is 0, 7% (1 abortion), so well. 3.0 times greater (Fig.10).The relative risk (OR) of having an incomplete abortion is 3.0 times higher in the MA group (OddsRatio 3.044).

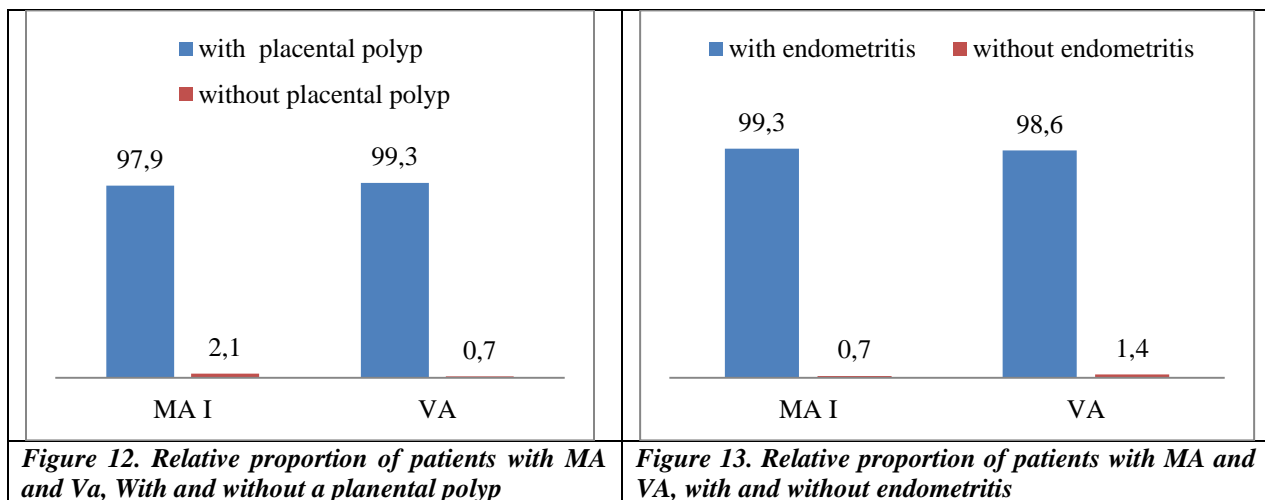
**Hematometer.** *Relative risk for hematometers:* Using Chi – square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA ,va) and the appearance of a hematometer, but it is not statistically significant due to the small number of cases with a hematometer (Sig.2-sided>0.05). In the group with MA, the relative proportion of cases with a hematometer was 2.9%, (4 abortions), and in the group with

VA – is 4, 3%, (6 abortions), so 1.5 three times less (fig. 11). The relative risk (OR) for the hematometer is  $< 1.0$ , therefore, the method type (MA, VA) is not a risk factor (OddsRatio 0.657).



**Placental polyp.** *Relative risk for a placental polyp:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA ,VA) and the appearance of a placental polyp, but it is not statistically significant due to the small number of cases of a placental polyp (Sig.2-sided $>0.05$ ). In the group with MA, the relative number of cases with a placental polyp is 2.1%, (3 abortions), and in the group with VA - is 0. 7%, (1 abortion), so 3.0 times more (fig.12). The relative risk (OR) of the appearance of a placental polyp is 3.0 times higher in the group with MA (OddsRatio 3.044).

**Endometritis.** *Relative risk of endometritis:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA, VA) and the appearance of endometritis, but it is not statistically significant due to the small number of cases of endometritis (sig.2-sided $>0.05$ ). In the group with MA, the relative proportion of cases of endometritis was 0.7% (1 abortion), and in the group with VA – is 1, 4% (2 abortions), so 2.0 times less (Fig. 13). The relative risk (OR) for endometritis is  $< 1.0$ , therefore, the method type (MA, VA) is not a risk factor (OddsRatio 0.496).



**Abdominal and pelvic pain.** *Relative risk of abdominal and pelvic pain:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA, VA) and the appearance of abdominal and pelvic pain, and it is statistically significant (Sig. 2-sided $<0.05$ ). With the Cramer correlation coefficient, it was measured that the relationship was moderate in strength (Cramer sV 0.4). In the group with MA, the relative proportion of cases with abdominal and pelvic pain was 54.3% (76 abortions), and in the

group with VA – is 20, 0% (28 abortions), so 3.0 times more (Fig. 14). The relative risk (OR) of abdominal and pelvic pain is 4.8 times higher in the group with MA (OddsRatio 4.750).

**Febrem, hyperthermia.** *Relative risk of hyperthermia:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA, VA) and the appearance of hyperthermia, and this is statistically significant (Sig. 2-sided<0.05). With the Cramer correlation coefficient, it was measured that the compound is weak in strength (Cramer sV 0.2). In the MA group, the relative proportion of cases of hyperthermia was 11.4% (16 abortions), and in the VA group – is 2.9% (4 abortions), so 3.9 times more (Fig. 15). The relative risk (OR) of hyperthermia is 4.4 times higher in the group with MA (OddsRatio 4.387).

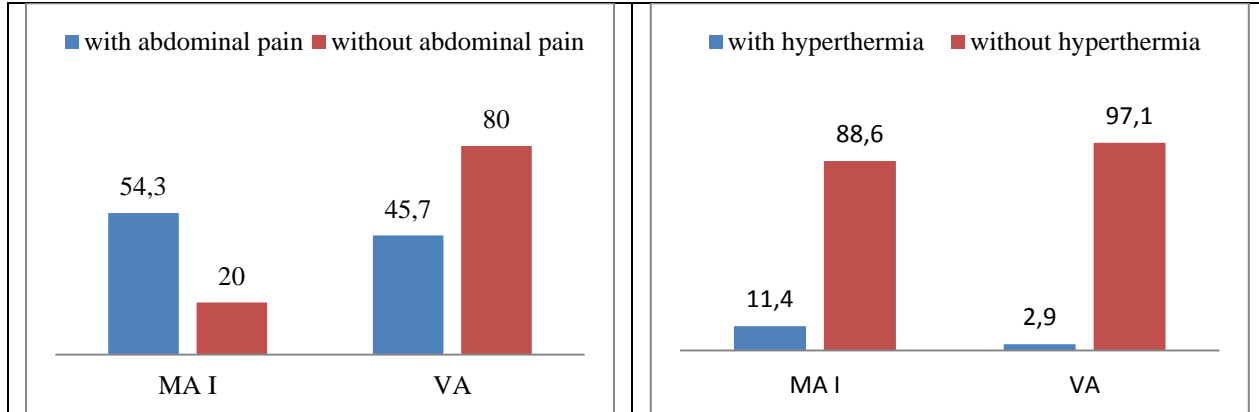


Figure 14. Relative proportion of patients with MA and VA, with and without abdominal pain

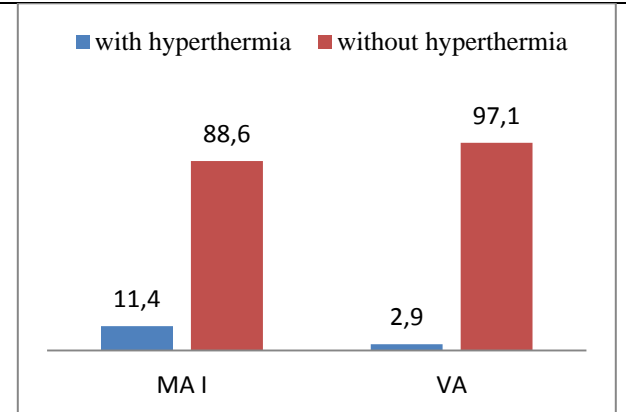


Figure 15. Relative proportion of patients with MA and VA, with and without hyperthermia

**Nausea.** *Relative risk of nausea:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA, VA) and the appearance of nausea, and it is statistically significant (Sig.2-sided<0.05). With the Cramer correlation coefficient, it was measured that the compound is weak in strength (Cramer Sv 0.3). In the group with MA, the relative proportion of cases of nausea was 30.7% (43 of abortion), and in the group With VA – is 7, 1% (10a6oppa), so well. 4.3 times higher (Fig.16). Relative risk (OR) the occurrence of nausea was 5.8 times higher in the group with MA (OddsRatio5.763).

**Vomitus.** *Relative risk of vomiting:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA, VA) and the appearance of vomiting, and it is statistically significant (Sig.2-sided<0.05). With the Cramer correlation coefficient, it was measured that the compound is weak in strength (Cramer sV 0.2). In the group with MA, the relative proportion of cases with vomiting was 12.1% (17 abortions), and in the group with VA - is 1.4% (2 abortions), so 8.6 times more (Fig. 17). The relative risk (OR) of vomiting is 9.6 times higher in the group with MA (OddsRatio 9.537).

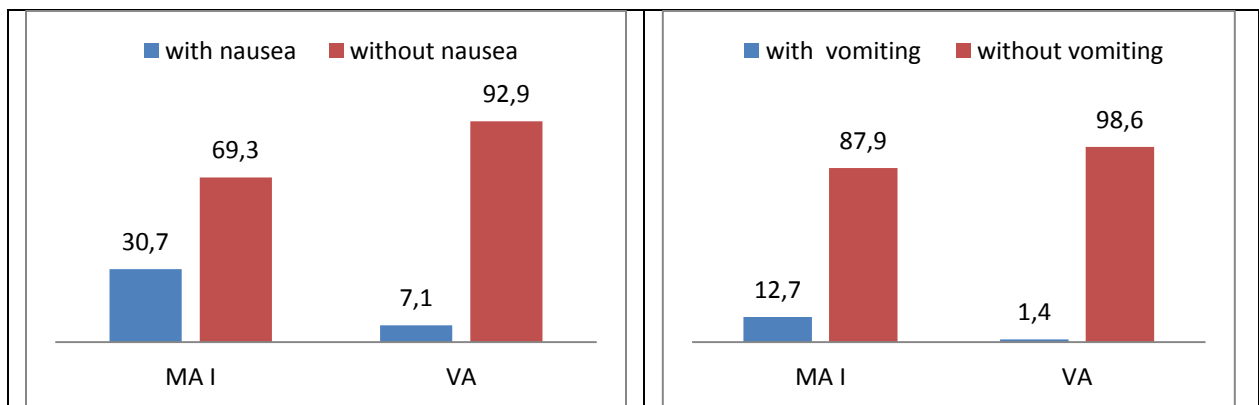


Figure 16. Relative proportion of patients with MA and VA, with and without nausea

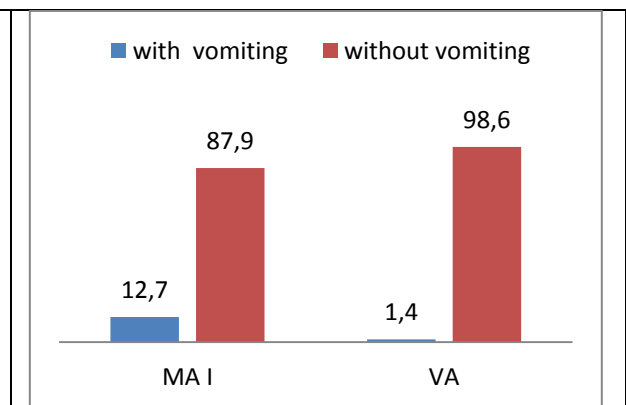
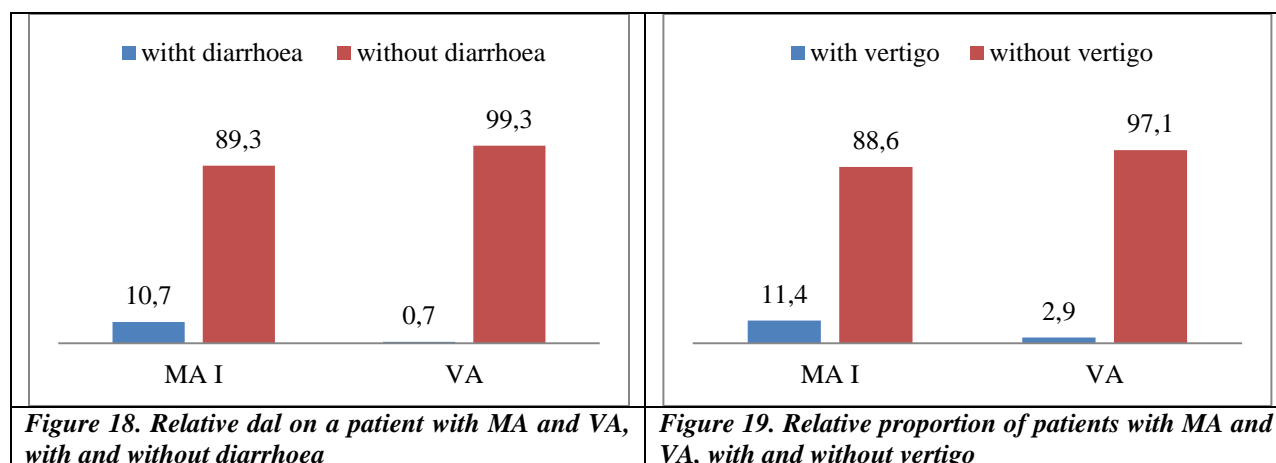


Figure 17. Relative proportion of patients with MA and Va, With and without vomiting

**Diarrhea.** *Relative risk of diarrhea:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA ,VA) and the appearance of diarrhea ,and it is statistically significant (Sig.2-sided<0.05). With the Cramer correlation coefficient, it was measured that the compound is weak in strength (Cramer sV 0.2).In the group with MA, the relative proportion of cases with diarrhea was 10.7% (15 abortions), and in the group with VA - is 0.7% (1 abortion), so 15.3 times more (Fig. 18).The relative risk (OR) of diarrhea was 16.7 times higher in the group with MA), (OddsRatio16.680).

**Vertigo.** *Relative risk for vertigo:* Using Chi-Square (chi-square) analysis, it was found that there is a causal relationship between the method of termination of pregnancy (MA ,VA) and the appearance of dizziness ,and this is statistically significant (Sig.2-sided<0.05). With the Cramer correlation coefficient, it was measured that the compound is weak in strength (Cramer sV 0.2).In the MA group, the relative proportion of cases of dizziness was 11.4%, (16 abortions), and in the VA group - is 2,9%, (4 abortions), so 3.9 times more (Fig. 19). The relative risk (OR) of vertigo was 4.4 times higher in the group with MA (OddsRatio 4.387).



The use of prostaglandin and subsequently prostaglandin analogues as a method of termination of pregnancy, since pomegranate. medical abortion significantly increases the potency and reduces complications when performing abortions. When the Mifepristone molecule was discovered in 1980. some parameters are improved during medical abortion, of which the most important is the reduction of the time interval until the completion of the abortion and the need to reduce the doses of prostaglandins.

Medical abortion is a highly effective (96.0% of completed abortions), relatively slow (within 8 hours) and safe method of termination of pregnancy. This is rarely associated with the need for repeated surgical intervention (14.0% of incomplete abortions), with a small relative proportion of early complications and extremely rare late complications that need to be used during the second trimester of pregnancy. Patients at high risk for incomplete abortion and infertility have a history of two or more previous abortions, as well as cesarean delivery. For patients with an increased risk, as well as with contraindications to medical abortion, it is recommended to use an alternative procedure-surgical abortion through dilation and curettage. (D&E). The use of medical abortion is associated with a lower labor cost (1.8 times), the same labor productivity and the same stay of patients in the hospital compared to surgical abortion.

Despite the undeniable advantages of medical abortion over surgery, future research should focus on improving pain relief methods and the optimal approach in cases of incomplete abortion when using the medical method.

### 5. CONCLUSIONS

In recent years, the efforts of doctors have mainly been aimed at improving the conditions and techniques for performing abortions in terms of efficiency, safety, reducing the risk of complications and facilitating the technique and continuity of methods from the patient.

In the middle of the last century, the most popular methods for terminating pregnancy were vacuum aspiration, dilatation and curettage, hysterotomyata, intraamniotic infusion of hypertonic salt solution, intra-or extraamniotic instillation on etacriidine lactate, prostaglandin analogues and intravenous or intramuscular oxytocin applications.

Of all these methods, most of which are currently of historical importance, vacuum aspiration has existed as a highly effective (97.0% of completed abortions), fast (15 minutes) and safe method of terminating pregnancy without the need for repeated surgical intervention and with a small relative proportion of early complications and extremely



rare late complications, which should be used as the "gold standard" during the trimester of pregnancy. Patients at risk of receiving hematometras, hemorrhages and endometritis have a history of previous vaginal infection, abortion or childbirth on the operative path need timely prevention. If there are contraindications to vacuum aspiration and for outpatient abortion, the use of medical abortion is proposed as an alternative.

Through the prism of modern medicine, medical abortion is the method of choice for terminating pregnancy in the first and second trimesters in the medical standards of an increasing number of countries around the world.

The main attention in the study is paid to the comparative analysis of the well-known surgical and medical method of abortion in terms of effectiveness, safety, early and late complications, as well as to the compilation of an algorithm for the use of medical abortion during IV and the second trimester of pregnancy.

Medical abortion should be considered as the first method of choice when terminating pregnancy in the second trimester, since its advantages over the surgical method benefit the patient, namely, a smaller number of early and late complications.

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