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POSSIBILITIES OF ARGON PLASMA APPLICATION IN MODERN OBSTETRICIAN-GYNECOLOGIST PRACTICE (LITERATURE REVIEW)

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ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ АРГОНОПЛАЗМЫ В СОВРЕМЕННОЙ ПРАКТИКЕ АКУШЕРА-ГИНЕКОЛОГА (ОБЗОР ЛИТЕРАТУРЫ)

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ZAMONAVIY AKUSHER-GINEKOLOGIYA AMALIYATIDA ARGON PLAZMASINI QO'LLANISH IMKONIYATLARI (ADABIYOTLAR TAHLILI)

The latest technologies of bloodless surgery (blood saving) are very quickly gaining more and more supporters all over the world. Currently, they are practicing in 120 specialized general surgical centers, 80 of them are located in the USA [2,3].As it is known, bleeding is one of the eternal problems in obstetrics, which many generations of scientists have worked on trying to solve. The importance of prevention and treatment of this complication is determined by the fact that obstetric bleeding occupies one of the first places in the structure of maternal mortality causes and makes up 17 % in it's structure as a pure form, 42 % as a competing cause and up to 78% as a background cause [6,8].

Today's shortage of high-quality donor blood and the risk of contamination by dangerous infections, makes the advantages of bloodless surgery undoubted and it's main principle is to save a person who finds himself on the operating table as much blood as possible [15,17].

Radiowave surgery and argonoplasma coagulation set new standards for minimizing intra and postoperative complications. Electrosurgical methods are increasingly used in the diagnosis and treatment of cervix, vagina, external genitalia diseases, as well as in "open" and endoscopic obstetric and gynecologic operations in our days.

Recent achievements in physics and medicine made it possible to create an innovative method for stopping bleeding and destruction of pathological formations using plasma energy [12, 15, 17].

Using scientific language, argon plasma coagulation is an electrosurgical non-contact monopolar method of high-frequency

current exposure on biological tissues using ionized electrically conductive argon gas which creates impact field between the operated tissue in which the electric gas is ionized and argon plasma jet is formed.

Currently, a large number of studies have appeared on the effective use of argonoplasmic coagulation (APC) in various fields of medicine. The APC method has been successfully used in open surgery, laparoscopy and thoracoscopy for surgical interventions for more than 5-7 years [1]. The plasma jet forms an argon cloud, which is ionized by the applied high-frequency (HF) voltage and forms an argon plasma arc, which transmits high-frequency energy contactless to the treated tissue [22]. The non-contact effect of HF current on the fabric almost completely eliminates the possibility of instrument "sticking" to the fabric. Due to the regular coagulation of extensive tissue areas and the possibility of limiting the depth of thermal exposure, the number of complications decreases and the effectiveness of treatment increases. Overheating and charring of tissues (carbonization) does not occur, since argon, is an inert gas which prevents combustion. Continuous gas supply reduces the temperature on the surface of the biological tissue, that results in minimization necrosis zone, and argon flow allows to conduct effective coagulation.

Radio waves usage is based on local heating of biological tissues, rapid heating leads to violent intracellular fluid boiling and vapors formation that tear the tissue at macro level, forming an incision, slow heating with a monopolar instrument leads to gradual evaporation of the liquid, protein denaturation and clogging of small vessels, and bipolar instrument causes gluing the walls of large vessels due to collagen formation, this effect lies in the basis of electrosurgical hemostasis. Thus, working with just one device, give the obstetrician-gynecologist the opportunity to simultaneously obtain a number of effects such as: cutting, cutting with coagulation, contact and non-contact coagulation, which occurs due to heating of biological tissues during direct tissue-device contact. This method completely allows to prevent sticking of the instrument applicator to the treated tissue, ensures uniform coagulation of large surfaces, control and limit the depth of thermal exposure, which reduces the risk of complications after operations and simplifies the surgeon's activities.

The main advantages of APC are [9, 16] the following:

- contactless coagulation;
- objectively controlled tissue coagulation depth - no more than 3 mm;
- application in three-dimensional space without instrument reorientation;
- possibility of usage on parenchymal organs;
- absence of smoke and odors;
- high efficiency of hemostasis;
- bactericidal effect;
- activation of repair processes as a result of increased neoangiogenesis;
- reduction of the adhesive process recurrence.

The disadvantages of the method are:

- insufflation of an additional volume of gas into the cavity when using endoscopic access (compensated by the usage of modern electronic insufflators);
- the effectiveness of hemostasis in bleeding from vessels with a diameter of less than 1.5 mm (due to modern innovations, it is possible to eliminate this disadvantage in the nearest future).

However, it is obvious that the number and value of the advantages significantly exceeds the minor disadvantages, which determines the choice of APC as an alternative method for high-quality and gentle surgical manipulation.

Modern obstetrics is impossible to imagine without cesarean section (CS), which is often used as a method of delivery. This increases the number of women of reproductive age with anamnestic indications for CS. Complications occur more often after such delivery than during childbirth per vias naturalis, that is why it is so important to find measures aimed to reduce their frequency.

Cesarean section (CS) has become more commonly used worldwide and has made a certain contribution to reducing the perinatal mortality rate [3, 5, 10,11]. Currently, according to M. Oden [8], "it can be stated that childbirth by CS and childbirth per vias naturalis differ little in terms of safety in modern well-equipped and organized hospitals in economically developed countries". The frequency of CS complications, according to different authors [2, 3, 6], varies from 2 to 15%, which is largely due to the existing differences in the methods of morbidity accounting. The probability of complications is caused by wound infection, hemostasis violation in it, operation techniques defects. Simultaneously with an increase in the frequency of abdominal labor, the question of the possibility of delivering women with uterus scar per vias naturalis is becoming more actual, but this requires the presence of a full-fledged scar [5, 12]. The main conditions for optimal tissue regeneration and the formation of a full-fledged scar are good blood circulation in the wound, excluding the development of ischemia and hypoxia of tissues in the suture area, and minimal inflammatory reaction, which is determined by the method of restoring the dissected uterine wall and the type of suture material [1, 4,7, 9, 13]. Data about influencing the methods on the activity of repair and the formation of a full-fledged scar are very few in literature [12, 13].

As it's known, CS in the lower uterine segment by a transverse incision with the imposition of a single-row continuous suture and uncomplicated postoperative period course is accompanied by the formation of a full-fledged uterus scar, promotes further delivery per vias naturalis. At the same time, the main problem is the improvement of the reparative process in the scar area after CS. In order to form a more complete uterus scar in CS, argonoplasmic coagulation (APC) is now used in modern obstetrics [].

Argonoplasma coagulation is one of the methods that improve the condition of the uterus scar and increase the effectiveness of surgical delivery outcomes. The ability to use argonoplasma coagulation in CS results in achieving the viability of the uterus scar, reducing intraoperative blood loss, improving the quality of life by lowering the severity of pain syndrome, abandoning antibacterial therapy and limiting the use of analgesics in the early postoperative period, as well as reducing the length of hospital stay [].

Performing a caesarean section using broadband argonoplasma technology safely and effectively creates conditions for a "bloodless" clean surgical field, contributes high-quality hemostasis, provides a reduction in the severity of postoperative pain syndrome, leads to a good wound healing, and a reduction in the length of hospital stay.

According to scientific research [9], in general, the duration of operation by using the APC decreased by 15-20 minutes. The course of the postoperative period was characterized by infiltration and soreness of the anterior abdominal wall suture absence on the 2nd-3rd days. There was also a lack of infiltration and / or liquid inclusions in the uterus suture and pre-bubble tissue (according to ultrasound), a decrease in the frequency of narcotic and non-narcotic analgesics administration, wound healing by primary tension, earlier discharge (on the 5th-6th day, without APC, discharge was carried out on the 7th-8th day) [4]. An important aspect of APC in CS use is a reduction in the length of uterus suture by 10-15% according to ultrasound data obtained on the 2nd day after surgery [9]. As a result of argonoplasmic coagulation, almost complete replacement of the incision zone with myocytes was found, while the traditional technique of surgery makes the scar completely presented by connective tissue [4].

The perspective of further research can be associated with the study of long-term results in operated women, which will become possible as they realize further reproductive plans.

It was noted that the processing of uterus suture with an argonoplasma torch in CS leads to the formation of not only a full-fledged scar, but also a wealthy myometrium zone adjoining the scar in the long-term period after childbirth. This fact is of great practical importance, since, as a number of studies shows, uterine rupture during childbirth does not occur along the scar itself, but next to it - in the area of tissues adjoining to the scar [7, 9]. The problem of injury healing (ruptures after childbirth) remains unexplored. It is known that these injuries lead to further pelvic organ tissue prolapse, urinary incontinence and deterioration of life quality [3,5]. In our opinion, the APC can be used to prevent all these complications.

APC is effectively used in cervix, vagina and external genitalia diseases treatment in gynecological practice [2, 11]. The issue of organ-preserving operations for uterine fibroids remains the main problem of

operative gynecology to date. Myomectomy as a method of surgical treatment, depending on the size, number and localization of nodes, has three negative aspects: the likelihood of the disease recurrence, massive intraoperative blood loss, incomplete viability of the uterus scar [12, 14].

Bleeding from myometrium tissues during myomatous node removal was stopped using APC in the FULGUR mode (forced deep argonoplasmic coagulation), after which the bed was carefully treated with an argon plasma torch in SPRAY mode (soft smooth argonoplasmic coagulation). According to research data, the presented technique of surgery using APC can also be successfully applied in pregnant women and women in labor if there are indications for conservative myomectomy during cesarean section [4, 9].

The ultrasound data [4] on the 4th-5th day after surgery differed from those obtained using traditional techniques: the infiltration of the suture was moderate, liquid inclusions in the suture were not detected. It should be noted that the thermal effect of argon plasma torch on myometrium in the area of myomatous node bed leads to a reduction of collagen fibers, as well as to decreasing the size of uterine defect and compacting it's edges.

Analyzing studies on the effectiveness of APC usage in laparoscopic and "open" myomectomy, revealed that the duration of surgery decreased by an average of 10-20 minutes, intraoperative blood loss and the duration of hospital stay compared with traditional electrosurgical technologies significantly decreased [3].

In recent years, APC has been used for the laparoscopic surgical treatment of external genital endometriosis. According to single studies [19], APC completely removes foci from the tissue surface without complications and with minimal thermal necrosis of coagulated areas.

Taking into account the unique features of argonoplasma effects on tissues, it is currently actively used for cervix pathology treatment. Modern conditions of care for patients with cervical pathology require adequate monitoring for one category of patients, and epithelium ablation (destruction) or cervix excision for another category [15,16]. Therefore, the requirements for the methods that doctor uses for adequate and effective treatment have increased significantly. When comparing the methods of cryodestruction, diathermoelectrocoagulation (DEC) and argonoplasmic ablation in patients with histological diagnosis of epidermizing endocervicosis, for example, it can be noted that APC has high efficiency, good tolerability and provides high rates of endocervix epithelialization [17]. According to colposcopy [11], recovery in 2.5 months after APC was 92%, after DEC - 88% and 48% after cryodestruction. More gentle electrosurgical effect of APC on tissues in comparison with diathermocoagulation, and the absence of rough cervix scarring in the long-term period after treatment can serve as an additional argument for it's usage in nulliparous women. Complete recovery after using APC method occurs much faster than after cryodestruction [2, 11].

These data prove the advantages of using argonoplasmic coagulation in operative gynecology with laparoscopic access.

Thus, at present, APC can be used in obstetrics and gynecology during operations on uterus (cesarean section, conservative myomectomy), at patients with external genital endometriosis, ovarian cysts and cervix pathology. The use of APC is possible both in laparotomy and laparoscopic gynecological operations [18,19].

The usage of APC increases the efficiency of hemostasis, shortens operation duration and the time of postoperative rehabilitation, accelerates the repair processes and reduces the severity of the surgical defect [14,16].

Researches aimed on studying the effects of this type of energy on biological tissues remain relevant in our days, confirming the effectiveness of APC usage in surgery, taking into account the assessment of tissue injury degree, as well as improving the methods of using APC in an obstetrician-gynecologist practice. The practical application of innovative techniques is an indicator of the progressiveness of a modern obstetrician-gynecologist striving to improve his own system of skills.

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