

**Ефективність проведеної терапії, за даними цистометрії  
у дітей з тяжким ступенем розладів сечовипускання, M±m**

Показник	До лікування, n=27	Група А, n=9	Група В, n=8	Група С, n=10
Максимальний об'єм сечового міхура, мл	115,4±8,5	147,5±11,6*	137,5±10,7*	192,6±12,3*#@
Об'єм сечового міхура при першому позиві, мл	57,2±4,3	101,2±11,5*	95,6±7,6*	132,7±12,1*#@
Внутрішньоміхуровий тиск, см водн. ст.	19,8±2,0	14,7 ±1,2	12,7±1,1	10,3±0,8*
Комплаєнс dV/dP	1,7+ 0,2	5,5±0,5*	4,2±0,4*#	8,1±0,6*#@

ціентів з тяжкими формами порушень.

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## APPLICATION OF NEW TECHNOLOGIES IN SURGICAL TREATMENT OF CHOLELITHIASIS AND BENIGN OVARIAN TUMORS IN POLYCYSTIC OVARY SYNDROME WITH GENERATOR OF AUTOMATIC WELDING OF BIOLOGICAL SOFT TISSUES

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**ПРИМЕНЕНИЕ НОВЫХ ТЕХНОЛОГИЙ В ХИРУРГИЧЕСКОМ ЛЕЧЕНИИ ЖЕЛЧНОКАМЕННОЙ БОЛЕЗНИ И ДОБРОКАЧЕСТВЕННЫХ ОПУХОЛЕЙ ЯИЧНИКОВ ПРИ СИНДРОМЕ ПОЛИКИСТОЗНЫХ ЯИЧНИКОВ С ИСПОЛЬЗОВАНИЕМ ГЕНЕРАТОРА АВТОМАТИЧЕСКОЙ СВАРКИ БИОЛОГИЧЕСКИХ МЯГКИХ ТКАНЕЙ**

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У 162 пацієнток (45 больних с ЖКБ и 117 женщин с доброкачественными опухолями яичников при синдроме поликистозных яичников) проанализированы результаты оперативного лечения. Контрольную группу составили 60 (20,0 %) пациенток, которым проводили оперативные



вмешательства с применением монополярной и биполярной электрокоагуляции. Исследуемую группу составили 102 (80,0 %) больных, в которой операции выполнялись с использованием генератора автоматической сварки мягких тканей. Установлено, что при использовании генератора сварки мягких тканей не происходит повреждения ткани печени или фолликулярного аппарата яичников, а значит, и потери овариального резерва.

**Ключевые слова:** желчнокаменная болезнь, синдром поликистозных яичников, генератор автоматической сварки мягких тканей, патоморфологические изменения.

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### APPLICATION OF NEW TECHNOLOGIES IN SURGICAL TREATMENT OF CHOLELITHIASIS AND BENIGN OVARIAN TUMORS IN POLYCYSTIC OVARY SYNDROME WITH GENERATOR AUTOMATIC WELDING OF BIOLOGICAL SOFT TISSUES

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**Introduction.** Such surgical methods as videolaparoscopic, endoscopic and other minimally invasive interventions have recently become widespread. But there is lack of discussion on efficacy and safety of modern methods of tissue dissection and hemorrhage removal. When performing endoscopic surgery, electrocoagulation is the method of choice. In this regard, the evaluation of the effectiveness of modern methods of tissue dissection of the ovary, liver cholestasis for hemostasis in surgery with endovideo tools is of great practical interest. Polycystic ovary syndrome (PCOS) is currently one of the most studied diseases in modern gynecology. Thanks to the development of the team of the E. O. Paton Electric Welding Institute initiated by Academician B. E. Paton it became possible to use high-frequency electric current to connect the soft tissues. A designed EC-high-frequency generator and a set of 300M1 specialized equipment allow welding of tissues on the basis of dosing modulated current which is automatically generated depending on the tissue impedance.

**Materials and methods.** The study included 162 patients who were treated from 2007 to 2010 in the medical center "Motor Sich" (Zaporozhye): with cholelithiasis — 45 (27.78%) patients, with PCOS and benign ovarian cysts — 117 (72.22%) patients; 26 (16.05%) patients underwent operative simultaneous operations on cholelithiasis, and polycystic ovary syndrome.

With cholelithiasis (45 (27.78%) patients) — the control group consisted of 12 (26.67%) patients who underwent videolaparoscopic cholecystectomy with monopolar and bipolar electrocoagulation. The study group — 33 (73.33%) were performed videolaparoscopic cholecystectomy using the automatic welding of biological soft tissues generator.

**Results and discussion.** In the study group, 33 patients (32.35%) with cholelithiasis, intraoperative hemostasis in the bed of the gall bladder was performed using the generator of automatic welding of biological soft tissues. There were no conversions in this group. The rest of patients had "dry" drains. The most interesting data obtained by the comparative effectiveness in patients in the study group with PCOS were 69 (67.65%) patients, which underwent laparotomic surgery with the generator of automatic welding of biological soft tissues — 43 (62.32%) patients and videolaparoscopic operations — 26 (37.68%) women and using the generator of automatic welding of biological soft tissues, as a rule, these were: wedge resection of the ovary — 2 (7.69%), demedulation — 3 (11.54%) and the most part — enucleation cysts followed if necessary by treatment of bed with the generator of automatic welding of biological soft tissues — 21 (80.77%) patients. The use of automatic welding generator allowed to perform soft tissue homeostasis in conjunction with a modified wedge resection of the ovarian tissue. In all these cases, surgical intervention in the field of ovarian tissue was treated with the generator of automatic welding of soft tissues.

**Conclusion.** (1) Methodology for surgery with the help of the generator of automatic welding of biological soft tissue is the advanced surgical technology, based on the principle of one instrument in the "welding" and "cutting", the main stages of surgical intervention in this case do not differ from traditional ones. (2) Analyzing advantages and disadvantages of the generator of automatic welding of biological soft tissue and monopolar, bipolar electrocautery, one should emphasize the significant differences of videolaparoscopic pictures of gallbladder bed and ovarian cyst's bed, the remained ovary with the wedge resection after hemostasis. If after the electrosurgical treatment of ovarian cyst bed, or left ovary with its wedge resection, there was a solid area of coagulation necrosis, the result of the generator of automatic welding of biological soft tissues it was visually absent or there was a minimal zone of thermal damage to the liver and the remaining ovarian tissue. (3) Using of the generator of automatic welding of biological tissue can shorten the duration of surgery, making it technically easier and more convenient for the surgeon, and reduces the amount of intraoperative complications as well. (4) For morphological study of removed specimens there was revealed that alternative changes in the tissue of the gall bladder, or ovarian tissue exposed to electrothermal effects correspond to the area of application of tool electrodes and do not spread to surrounding structures, leaving them intact. In the area of intervention together with homogenized tissue there are tissue components including cells that are not structurally damaged, which is an evidence of further repair and there is no loss of ovarian reserve in women with polycystic ovary syndrome and benign ovarian cysts on the background of PCOS.

**Key words:** gallstone disease, polycystic ovarian syndrome, the generator of automatic welding of biological soft tissues, pathologic changes.

## Introduction

Such surgical methods as videolaparoscopic, endoscopic and other minimally invasive interventions have recently be-

come widespread. But there are no discussion of efficacy and safety of modern methods of tissue dissection and hemorrhage removal. When performing endoscopic surgery, electrocoagu-

lation is the method of choice [2; 3]. The features of these surgical interventions with ultrasonic and laser scalpels are highlighted in a large number of scientific works. When performing sur-



gery on the liver and biliary tract, as well as the ovaries, at present there are conflicting data on the physical trauma of modern hemostasis. In this regard, of great practical interest is the evaluation of the effectiveness of modern methods of tissue dissection of the ovary, liver cholestasis for hemostasis in surgery with endovideotools [2].

Polycystic ovary syndrome (PCOS) is currently one of the most studied diseases in modern gynecology, reproductive endocrinology and gynecology. The frequency of this pathology is approximately 8–11% of reproductive age women in the structure of anovulatory infertility, this pathology has a dominant position — up to 80% of cases. The main problem of patients suffering from PCOS, without a doubt, infertility [4]. In addition, they observe irregular menstruation, acne, weight gain, excessive hair growth. A high risk of development in these patients of such diseases as diabetes, cardiovascular disorders, benign ovarian cysts, malignant tumors of the uterus and ovaries is quite extensively discussed recently [1; 3]. Patients with PCOS, benign ovarian tumors and endometriosis have a tendency to disruption of ovarian function and, consequently anovulation and infertility, and the occurrence of malignant ovarian tumors [1]. These symptoms, which are available in various combinations in all patients with PCOS require treatment, especially surgical [3]. It is well known that the history of PCOS is associated with the names of Stein and Leventhal, who first described this condition and have demonstrated the effectiveness of ovarian wedge resection [1; 3; 5]. The interest in the surgical treatment of PCOS is increased due to improved technology and the widespread introduction of laparoscopy, the method characterized by a minimally invasive intervention and the risk of adhesion formation. The advantage of laparoscopy is absence of risk of hyperstimula-

tion, multiple pregnancy and a possibility of elimination of often associated peritoneal factor of infertility. The use of new highly technical operational techniques has allowed a breakthrough in the treatment of polycystic ovary syndrome and benign cysts of the ovary, but at the same time, new problems occurred, which caused a revision of both the surgical treatment management of this pathology and the use of safer techniques during surgery [6].

From 30-s to 80-s years of the last century, surgery on ovaries with PCOS was performed by laparotomy, and although many authors reported a higher pregnancy rate, but it turned out that the risk of postoperative adhesions with violation of uterine tubes patency, and intraoperative damage to the ovarian follicular apparatus up to castration at these operations was great enough [3–5; 7]. Possible complications are very dangerous to the reproductive function of the patient, and sometimes irreparable. During the period of videolaparoscopic surgery have been developed and introduced into clinical practice different ways of surgical interventions on the ovaries: wedge resection, wedge resection in combination with omentooariopexy to improve blood supply to the rest of the ovaries, partial or complete decortication ovaries, ovarian cautery monopolar coagulator or an argon laser, diathermocoagulation, laparoscopic ovarian endocoagulation and some other [3; 7; 8].

High-frequency electrosurgery belongs to new medical technologies, without which it is impossible to perform surgery in the majority of specialties such as gynecology, surgery, oncology, gastroenterology, and many others [4; 6; 7].

Thanks to the development of the team of the E. O. Paton Electric Welding Institute initiated by Academician B. E. Paton it became possible to use high-frequency electric current to connect the soft tissues. A designed EC-high-frequency generator and a

set of 300M1 special equipment allows welding of tissues on the basis of dosing modulated current which is automatically generated depending on the tissue impedance [6].

**Purpose.** The study of the effectiveness of the intraoperation usage of the generator of biological soft tissues automatic welding with performance of surgical interventions for gallstone disease, as well as polycystic ovary syndrome and benign ovarian cysts on the background of PCOS.

### Materials and Methods

The study included 162 patients who were treated from 2007 to 2010 in the medical center “Motor Sich” (Zaporozhye), who performed surgery on cholelithiasis— 45 (27.78%) patients, as well as PCOS and benign ovarian cysts — 117 (72.22%) patients. 26 (16.05%) patients underwent operative simultaneous interventions for gallstones, and polycystic ovary syndrome.

With cholelithiasis (45 (27.78%) patients) the control group consisted of 12 (26.67%) patients who underwent videolaparoscopic cholecystectomy with monopolar and bipolar electrocoagulation. The study group — 33 (73.33%) patients was performed a videolaparoscopic cholecystectomy using the generator of automatic welding of biological soft tissues. Distribution of patients of this group by type of the inflammatory process was as follows: chronic cholecystitis — 2 (16,67%) patients, catarrhal cholecystitis — 3 (25,0%), phlegmonous cholecystitis — 5 (41,66%), gangrenous cholecystitis — 2 (16,67%). In the control group distribution of women was as follows: chronic cholecystitis — 7 (21,21%), catarrhal cholecystitis — 8 (24,24%), phlegmonous cholecystitis — 12 (36,37%), gangrenous cholecystitis — 6 (18,18%).

With PCOS (117 (72.22%) women) — the control group consisted of 48 (41.03%) patients who underwent surgery



using monopolar and bipolar electrocoagulation (21 (43.75%) — laparotomic and 27 (56.25%) — videolaparoscopic). The study group included 69 (58.07%) patients who were operated on with using the generator of automatic welding of biological soft tissues (43 (62.32%) — laparotomic and 26 (37.68) — videolaparoscopic). By age and concomitant pathology structure both the study and control groups were significantly homogeneous.

The study and control groups had no differences in the preoperative examination, preoperative preparation (if required), providing intraoperative and postoperative treatment. The choice of surgical technique to stimulate ovulation depended on the type of polycystic ovaries, the duration of anovulation.

In the control group 48 (41.03%) women performed the following surgeries: laparotomic ovarian wedge resection — 2 (4.17%) patients, laparotomic cystectomy — 19 (39.58%), videolaparoscopic ovarian wedge resection — 7 (14.58%) women, videolaparoscopic diathermocoagulation (thermocoagulation of ovaries with heated electric shock paddle, often bipolar clamp) — 9 (18.75%) patients, videolaparoscopic electrocautery (4 to 20 holes a depth of 5–15 mm were made with a monopolar electrode) — 11 (22.92%) patients.

In the study group, 69 (58.07%) patients were performed laparotomic surgery for benign cysts on a background of PCOS — 43 (62.32%) patients and videolaparoscopic operation — 26 (37.68) of women using the generator of automatic welding of biological soft tissue, as a rule, these were: wedge resection of ovary — 2 (7.69%) patients, drilling — 3 (11.54%) and women with benign cysts — cystectomy — enucleation of cysts followed, if necessary, with a partial processing of the bed using an automatic generator welding of biological soft tissues — 21 (80.77%) patients.

For studying the morphological structure of tissue in the welding zone after surgical intervention in PCOS ovaries and benign ovarian cysts, ovarian tissue slices with a removed cyst, as well as pieces of tissue after surgery were fixed in neutral formalin, embedded in paraffin blocks and stained with hematoxylin and eosin.

### Discussion and Results

We analyzed the results of surgical treatment of 162 patients.

In the control group 60 (37.04%) women with cholelithiasis — 12 (26.67%) patients who underwent videolaparoscopic cholecystectomy with unipolar — 4 (20,0%) patients, and bipolar electrocoagulation — 8 (66.67%) patients as well as with PCOS and benign ovarian cysts on a background of PCOS — 48 (80.0%) women, all methods of surgical laparotomic ovarian wedge resection — in 2 (4.17%) patients, laparotomic cystectomy — in 19 (39.58%), videolaparoscopic ovarian wedge resection — 7 (14.58%) women, videolaparoscopic diathermocoagulation (thermocoagulation ovaries with heated electric shock paddle, often bipolar clamp) — in 9 (18.75%) patients, videolaparoscopic electrocautery (monopolar electrode made from 4 to 20 holes with depth of 5–15 mm) — 11 (22.92%) patients had almost the same results, no difference from those of other authors mentioned in various home and foreign literature. In the study group, 33 patients (32.35%) with cholelithiasis, intraoperative hemostasis in the bed of the gall bladder was performed using the generator of automatic welding of biological soft tissues. There were no conversions in this group. Intraoperatively in 4 (12.12%) patients with destructive forms of inflammation of the gall bladder perforation occurred at the time of its touching, to remove the defect and to prevent automated generator bile expiration used welding of biological soft tissues.

In the postoperative period during the first days 2 (6.06%) patients had “scarce” discharge from the drainage. The remaining patients had “dry” drains.

The most interesting data were obtained by the comparative effectiveness in patients in the study group with PCOS — 69 (67.65%) patients, which underwent laparotomic surgery with use of the generator of automatic welding of biological soft tissues — in 43 (62.32%) patients and videolaparoscopic operations — in 26 (37.68%) women and using the generator of automatic welding of biological soft tissues, as a rule, were: wedge resection of the ovary — in 2 (7.69%), demedulation — in 3 (11.54%) and cysts enucleation followed, if necessary, treatment of bed with generator of automatic welding of biological soft tissues — in 21 (80.77%) patients.

During laparotomy in PCOS we conducted wedge resection of one or several of the most changed parts of ovarian tissue, which led to a reduction of its size to nearly normal size. In benign cysts we performed enucleation of a cyst. The operation was carried out as follows: fringing small slits along the edges of the cyst, which partly stood above the ovarian tissue was separated from the surrounding tissues of the epididymis. Further “bluntly” and twisting separated from the ovarian tissue itself, while trying not to open the cavity of the cyst. In order to secure hemostasis in wedge resection or ovarian cysts enucleation, cyst’s bed was treated using the generator of automatic welding of soft tissues. The use of automatic welding generator is allowed to perform soft tissue homeostasis in conjunction with a modified wedge resection of the ovarian tissue.

During videolaparoscopic operations, we used conventional ports for laparoscopic surgery in the pelvic organs, the sites of introduction were standard. For the robot arm of automatic weld-



ing generator of soft tissue there was used a 10 mm diameter port. Then, after revision, resection or enucleation ovarian cyst (operation of selection and twisting was produced by mechanical manipulators "bluntly", trying not to damage the cyst), or demedulation — removal of mostly stromal ovarian tissue using a special tool that connects to the generator automatically welding of soft tissues (the advantage of the method lies in the preserving ovarian follicular apparatus and without loss of ovarian reserve). In all these cases, surgical intervention in the field of ovarian tissue was treated with the generator automatic welding of soft tissues. The developed surgical procedures were applied for declarative patent of Ukraine and a positive response has been received.

Deaths and complications in early and late postoperative periods in either study, nor in the control groups were not observed.

### Conclusions

1. Methodology for surgery with the help of the generator of automatic welding of biological soft tissue is the advanced surgical technology, based on the principle of one instrument in the "welding" and "cutting", the main stages of surgical intervention in this case do not differ from traditional ones.

2. Analyzing advantages and disadvantages of the generator of automatic welding of biological soft tissue and monopolar, bipolar electrocautery, and should emphasize the significant differences of videolaparoscopic pictures of gallbladder bed and ovarian cyst's bed, ovarian, or remaining with its wedge resection, after hemostasis. If after the electrosurgical treatment of ovarian cyst bed, or left ovary with its wedge resection, there was a solid area of coagulation necrosis, the result of the generator of automatic welding of biological soft tissues it was visually absent or there was a minimal zone of

thermal damage to the liver and the remaining ovarian tissue.

3. Using of the generator of automatic welding of biological tissue can shorten the duration of surgery, making it technically easier and more convenient for the surgeon, and reduces the amount of intraoperative complications as well.

4. For morphological study of removed specimens there was revealed that alterative changes in the tissue of the gall bladder, or ovarian tissue exposed to electrothermal effects correspond to the area of application of tool electrodes and do not spread to surrounding structures, leaving them intact. In the area of intervention together with homogenized tissue there are tissue components including cells that are not structurally damaged, which is an evidence of further reparation and there is no loss of ovarian reserve in women with polycystic ovary syndrome and benign ovarian cysts on the background of PCOS.

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