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FEATURES OF THE METHOD ON REDUCING COMPLICATIONS AND INCREASING THE EFFICIENCY OF TRANSURETHRAL LASER RESECTION OF THE PROSTATE

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Introduction. Benign prostatic hyperplasia (BPH) is characterized by the occurrence of disorders of urine storage and bladder emptying. Most men over the age of 60 years are affected to some degree. Transurethral laser resection of the prostate (TURP) is minimally invasive, endoscopic and one of the modern technologies of biomedical engineering, which can cause minimal harm to patients and is recognized as the "gold" standard in urology. It is widely used for the treatment of BPH complicated by acute urinary retention.

Main part. The management of patients with BPH is complex. Emptying and retention disorders can be treated by various pharmacological and surgical means. The article provides data on the experience of combining the technology of transurethral laser resection with medical postoperative therapy to reduce complications. Using the example of postoperative use of "Levofloxacin" in 179 patients, the effectiveness of this combination was proven.

Conclusions. 1. Minimally invasive transurethral laser resection of the prostate gland is one of the promising methods of prostate treatment, which significantly reduces risks for patients and is recognized as the "gold" standard in urology. Laser endoscopic resection of the prostate is one of the modern technologies of biomedical engineering.

2. The result of surgical treatment of patients with benign prostatic hyperplasia by laser resection largely depends on the appointment of adequate postoperative antibiotic prophylaxis.

3. The combination of the laser resection method with the postoperative use of levofloxacin in patients with benign prostatic hyperplasia complicated by acute urinary retention allows to improve the results of surgical treatment by reducing the development of complications in the postoperative period by 1.6 times.

Keywords: transurethral laser resection; benign prostatic hyperplasia; antibiotic prophylaxis.

Introduction

Benign prostatic hyperplasia (BPH) is one of the most common diseases in elderly men. At the age of 40 years BPH is found in 30-40% of men, and its prevalence increases almost linearly to 70-80% in people over 80. However, BPH is a purely histological definition and should be distinguished from benign prostate enlargement, which describes an increase prostate, and symptoms of the lower urinary tract (LUT), which usually lead to medical treatment [1]. Low urinary tract symptoms (LUTS) can be divided into symptoms of accumulation (urgency, frequency, nocturia and urinary incontinence), symptoms of urination (decreased flow and feeling of incomplete emptying). To date, they are best quantified through validated questionnaires such as the International Prostate Symptom Assessment (IPSS) or the American Urological Association (AUA) Symptom Assessment [1]. LUTS in the elderly is mainly caused by urodynamics changes in the lower urinary tract, such as benign prostate obstruction and hyperactivity or insufficient detrusor activity [2].

Benign prostatic hyperplasia (BPH) is one of the most common diseases of elderly men, the prevalence of which is progressively increasing. The etiology of the disease remains completely unexplored [3].

According to demographic data, in Ukraine, as in most European countries, there is a trend of general population aging. Thus, according to the WHO, there is a significant increase in population due to people over 60 years, the rate of which significantly exceeds the growth of the population as a whole [1]. The prevalence of moderate / severe CNS (IPSS > 7) is about 20% in the 5th, 30% in the 6th and 40% in the 8th decade of life. Due to demographic change, this figure will increase significantly to about 500,000 in the next 2 decades, which also emphasizes its socio-economic significance [3].

The high prevalence of benign prostatic hyperplasia (BPH) in elderly and senile men determines the relevance of the diagnosis and treatment of this disease [2].

It was found that 40-50% of men aged 50-64 years have some symptoms caused by BPH [4, 5, 6]. In other countries, this pathology is also widespread.

In the United States, the incidence of BPH reaches 34.4 per 1,000 population and 6.4 million visits to the doctor are registered annually, more than 300 thousand surgical interventions are performed with a total cost of more than 2 billion dollars [7, 8].

In Ukraine in 2020, the incidence of BPH was 321.6 per 100,000 population. Almost 17,000 prostate surgeries have been performed, a significant proportion of which are photo selective vaporization of the prostate (PVP surgery) [2].

Most of the operations are performed using the technology of minimally invasive endoscopic transurethral laser resection of the prostate, which reduces risks for patients. Laser endoscopic resection of the prostate is one of the modern technologies of biomedical engineering, which causes minimal harm to patients, is recognized as the "gold" standard in urology, and is widely used abroad and in Ukraine.

The use of laser resection of the prostate has a number of advantages, which are as follows:

- absence of contact with biofabric, which ensures a high level of asepticity;
- the laser beam has a good coagulation effect on small blood vessels and capillaries, which reduces blood loss;
- the thermal burn zone is much smaller compared to other resection methods;
- regeneration processes of damaged tissue are accelerated;
- the terms of postoperative rehabilitation of patients are reduced.

However, it is permanent Continuous improvement of surgical methods of treatment and careful selection of patients to determine the optimal method of intervention, unfortunately, does not always give the patient the expected result and does not avoid complications in the postoperative period [3].

The frequency of complications that complicate the course of the disease, especially in connection with surgical treatment of patients, remains high, despite the long-standing, multifaceted and large-scale resistance to their development [4-6]. It is proved that the most common early complications of prostate surgery are the development of acute inflammatory process in the urogenital organs, bleeding from the "bed" of the removed adenomatous tissue of the prostate [7].

It is known that the occurrence of early postoperative complications after surgical treatment of BPH is most often associated with chronic urinary tract infection [8-10]. The frequency of chronic prostatitis with BPH, according to studies of intraoperatively removed prostate tissue, is 70-100% [11]. Infectious and inflammatory diseases of the urogenital tract in men are characterized by a variety of etiological agents, the presence of mix-infections and the growing importance of sexually transmitted diseases (STDs).

Of interest are the results of studies showing that 55% of men and 70% of women over the age of 60

found laboratory markers of STDs, both overt and past.

Observation of chronic inflammation, accompanied by histological changes in BPH in pathological drugs, has led to the suspicion that inflammation plays a role in the development of BPH, as well as LUTS. Local inflammation can be triggered by a viral or bacterial infection, which will lead to the secretion of cytokines, chemokines and growth factors that are involved in the inflammatory response with the subsequent growth of epithelial and stromal cells of the prostate [4]. It has been suggested that the inflammatory response is continued by the release of prostate autoantigens after tissue damage, leading to sensitization of the immune system and the onset of autoimmune reactions [4].

Important factors in this process are prostate stromal cells that activate CD4 + lymphocytes and proinflammatory cytokines and chemokines, such as interleukin-8 of stromal origin [19]. Inflammation of the prostate was associated with general clinical progression and an increased risk of urinary retention and the need for surgery [20]. In addition, a positive association between high plasma C-reactive protein levels and the development of moderate to severe CNS has been reported.

It was also found that every second patient with BPH who needs surgical treatment is infected with one or another pathogen of STDs, and half of the infected patients have a mixed infection [12]. Chronic inflammatory process in the prostate and urethra in patients with BPH is significantly more often caused by STDs (61%) compared with opportunistic pathogens (42%) [13]. The presence of a chronic inflammatory process in the prostate and/or urethra significantly exacerbates the symptoms of lower urinary tract in this group of patients.

It was found that in patients with BPH infected with STDs, the incidence of early postoperative complications of the urogenital organs is almost three times higher than in uninfected, namely: infectious-inflammatory complications occur 2.5 times, and long-term or profuse macrohematuria in - 4 times more often [14].

Despite the fact that conservative treatments for BPH are becoming increasingly popular, the surgical method remains the main one [14].

The era of surgical treatment of this category of patients was discovered in the XIX century by the method of open enucleation of prostate adenoma [15, 16].

Electrosurgery in urological practice was first used in the nineteenth century by E. Bottini, who used an electroplating battery to destroy prostate tissue [17].

Nowadays, there are many surgical methods of treating patients with BPH, both invasive (prostatectomy) and minimally invasive (laser vaporization, transurethral resection of the prostate, laparoscopic prostatectomy), methods of electrophysical and temperature exposure, stenting [18-20].

Postoperative results of treatment of patients with BPH: terms of inpatient and outpatient periods, the number and complexity of postoperative complications, terms of rehabilitation of the patient, postoperative mortality depend on the choice of surgical method of surgical treatment [21-23].

One of the laser technologies that has been widely used in the last five years is high-power potassium-titanyl-phosphate [KTR] (532 nm) photoselective laser vaporization of BPH. This laser technology is implemented as GreenLight PV photoselective laser vaporization system (American Medical Systems, Minnetonka, MN). The word laser is actually an abbreviation that stands for "light amplification by stimulated emission of radiation" - the propagation of light stimulated by radiation. Laser light is characterized by the propagation of simple monochromatic coherent light with a wavelength of 532 nm, emitted by a laser material that transmits electric current (semiconductor, crystals, gas or paint). This light delivers energy, which, absorbed in the right chromophore, is converted into heat. The level of thermal energy should be sufficient to vaporize the required area. During surgery, laser energy can form two types of laser exposure to biological tissue: coagulation, when the tissue is heated below the boiling / vaporization point but above the protein denaturation threshold; and vaporization, which means heating the tissue above the boiling point / vaporization, which leads to the destruction and removal of tissue [24, 25].

Antibiotic prophylaxis of postoperative complications in modern surgery and urology is almost a mandatory element of patient treatment. At any operation, even at ideal observance of all rules of asepsis and antiseptics, necessarily by the end of operation in 80-90% of cases there is a penetration of microorganisms into a wound. Even catheterization of the bladder in 40-60% leads to cross-contamination of the urinary tract [26].

The purpose of antibiotic prophylaxis is to create a concentration of the drug in the blood and tissues that will either stop the infectious process in the initial phase of development, or minimize the development of infectious complications in the postoperative period. No less important for antibiotic prophylaxis is the choice of medication.

Aim of study

It consists in improving the results of transurethral resection of the prostate gland in patients with BPH complicated by acute urinary retention by combining it and optimizing antibacterial prophylaxis of postoperative complications in the early postoperative period.

Materials and methods

The study is based on the results of the analysis of surgical treatment of 179 patients with BPH, complicated by acute urinary retention, who underwent PVP surgery (photoselective vaporization of the pros-

tate). The PVP operation was performed using a GreenLight PV system and an 80-WKTR laser (laser scope, San Jose, Calif., USA). The visualization of the operation in the StarPulse laser device is transmitted by a subtle glow using a 600 μ m laser fiber with a side glow and a thin end that refracts the beam by approximately 70°. To improve the efficiency of vaporization, technical improvements were made based on the improvement of some characteristics of the laser beam, which led to the creation of a new high-power 532-nm laser system GreenLight HPS. This advanced laser system delivered the same 532-nm wavelength with the same absorption coefficient. However, the latter system consisted of laser diodes instead of arcuate lamps as a power source (based on ND: YAG), which provided radiation with a beam with double frequency and 532-nm wavelength. This allowed the system to deliver 120-watt quasi-constant energy with a higher potential for vaporization. Modification of the system included a double power unit with two pedals: 1 - to perform vaporization with the supply of high power energy (80-120 W) and 2 - to create the effect of coagulation with low energy (50 W).

The age of patients ranged from 51 to 84 years, the mean age was 64.9 ± 5.1 years. Urological comprehensive examination in the preoperative period of all patients was conducted in accordance with the Order of the Ministry of Health of Ukraine № 135 of 04.03.2009 "On approval of the clinical protocol for medical care for patients with benign prostatic hyperplasia".

To characterize the course of the early postoperative period in patients, the following complications were considered: exacerbation of chronic pyelonephritis, acute urethritis, acute orchepididymitis and long-term macrohematuria.

Patients were divided into two groups:

Group I (n = 85) - operated, in the early postoperative period was prescribed ceftriaxone (1 g/m 1 time per day);

Group II (n = 94) - patients in the early postoperative period received levofloxacin (500 mg iv drip 3 - 5 days with subsequent transition to oral administration, 1 time per day);

The probability of differences was assessed using Student's t-test. The difference between the values compared was considered probable at $p < 0.05$.

Results and discussion

Analyzing the obtained data, it was found that in the early postoperative period in 43 (24.1 %) patients had complications. 34 (19.0 %) operated developed one complication, and 9 (5.1%) operated had 2 complications.

The structure of postoperative complications is presented in Fig. 1.

The most common complication was long-term macrohematuria, which was observed in 23 (12.9 %) patients. Exacerbation of chronic pyelonephritis occurred in 13 (7.3 %) operated, acute urethritis devel-

oped in 7 (3.9 %) patients, acute orchiepididymitis was observed in 9 (5.0 %) patients.

The data in Table 1 indicate that BPH patients who received levofloxacin in the early postoperative period had a lower complication rate than ceftriaxone-treated patients.

In particular, the use of levofloxacin in patients of group II, with the aim of antibiotic prophylaxis of postoperative complications after PVP surgery, allowed to reduce 1.6 times ($p < 0.05$) the frequency of the latter, compared with patients of group I.

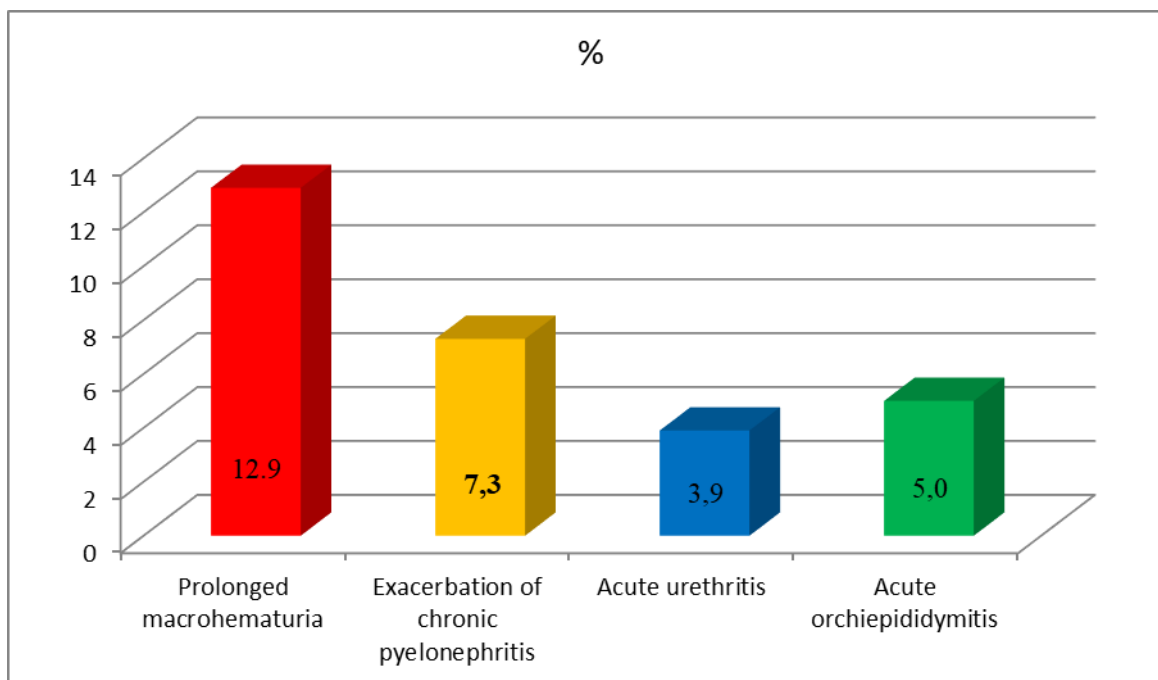


Fig.1 The structure of early postoperative complications in patients with benign prostatic hyperplasia after photoselective vaporization of the prostate

Table 1: Frequency of early postoperative complications depending on the received antibacterial therapy

Complications	Number of patients				p - value
	Group I (n=85)		Group II (n=94)		
	abs. n	%± SE	abs. n	%± SE	
Acute orchiepididymitis	4	4,7±2,3	5	5,3±2,3	>0,05
Acute urethritis	5	5,9±2,6	2	2,1±1,5	>0,05
Exacerbation of chronic pyelonephritis	8	9,4±3,2	5	5,3±4,8	>0,05
Total infectious and inflammatory	17	20,0±4,3	12	12,7±3,4	>0,05
Prolonged or profuse macrohematuria	14	16,5±4,0	9	9,6±3,0	>0,05
Total	31	36,5±5,2	21	22,3±4,3	<0,05

Conclusions

Taking into account the results of the study, the following conclusions:

1. Minimally invasive transurethral laser resection of the prostate gland is one of the promising methods of prostate treatment, which significantly

reduces risks for patients and is recognized as the "gold" standard in urology. Laser endoscopic resection of the prostate is one of the modern technologies of biomedical engineering.

2. The result of surgical treatment of patients with benign prostatic hyperplasia by laser resection

largely depends on the appointment of adequate postoperative antibiotic prophylaxis.

3. The combination of the laser resection method with the postoperative use of levofloxacin in patients with benign prostatic hyperplasia complicated by acute urinary retention allows to improve the results of surgical treatment by reducing the development of complications in the postoperative period by 1.6 times.

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ОСОБЛИВОСТІ МЕТОДУ ЩОДО ЗМЕНШЕННЯ УСКЛАДНЕНЬ ТА ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ТРАНСУРЕТРАЛЬНОЇ ЛАЗЕРНОЇ РЕЗЕКЦІЇ ПРОСТАТИ

Доброякісна гіперплазія передміхурової залози (ДГПЗ) характеризується виникненням розладів накопичення сечі та спорожнення сечового міхура. Більшість чоловіків у віці старше 60 років страждають певною мірою.

Трансуретральна лазерна резекція передміхурової залози (ТУРП) – малоінвазивна, ендоскопічна та одна із сучасних технологій біомедичної інженерії, яка завдає мінімальної шкоди пацієнтам і визнана «золотим» стандартом в урології. Широко використовується для лікування ДГПЗ, ускладненої гострою затримкою сечі. Ведення пацієнтів з ДГПЗ є комплексним. Порушення спорожнення та затримки можна лікувати різними фармакологічними та хірургічними методами. У статті наведено дані про досвід поєднання технології трансуретральної лазерної резекції з медикаментозною післяопераційною терапією для зменшення ускладнень. На прикладі післяопераційного застосування «Левовлоксацину» у 179 пацієнтів доведено ефективність цієї комбінації.

Малоінвазивна трансуретральна лазерна резекція передміхурової залози є одним із перспективних методів лікування простати, який значно знижує ризики для пацієнтів і визнаний «золотим» стандартом в урології. Лазерна ендоскопічна резекція передміхурової залози є однією із сучасних технологій біомедичної інженерії. Результат хірургічного лікування хворих на доброякісну гіперплазію передміхурової залози методом лазерної резекції значною мірою залежить від призначення адекватної післяопераційної антибіотикопрофілактики.

Поєднання методу лазерної резекції з післяопераційним застосуванням левофлоксацину у хворих на доброякісну гіперплазію передміхурової залози, ускладнену гострою затримкою сечі, дозволяє покращити результати хірургічного лікування за рахунок зменшення розвитку ускладнень у післяопераційному періоді в 1,6 раза.

Ключові слова: трансуретральна лазерна резекція, доброякісна гіперплазія передміхурової залози, антибіотикопрофілактика.

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