

Photoselective laser vaporization of the prostate in benign prostatic obstruction: sexual function in focus

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The objective: to determine the effect of photoselective laser vaporization (FVP) on individual IIEF domains (sexual activity, libido, erection, ejaculation, orgasm, satisfaction with intercourse) in sexually active men with BPO, as well as the factors on which this effect depends.

Materials and methods. 95 sexually active patients with benign prostatic obstruction (BPO) (prostate volume >40 cm³, maximum urinary flow rate Q_{max} <10 ml/s; QoL_{≥4}) at the age of 45 to 60 years underwent FP (GreenLight XPS, MoxyFiber) ... Sexual function (IIEF), urination parameters (PSS/QoL, PVR, Q_{max}), prostate volume, intravesical prostate protrusion, PSA were assessed before the intervention and 3 months after.

Results. PVP had a statistically significant and clinically significant effect on micturition parameters characterizing obstruction, prostate size and QoL. The median IPSSobstructive decreased by 6 (4–7) points (W=7.6; P<0.01), PVR by 48 (38–60) ml (W=6.2; P<0.01), IPP by 0.9 (0.5–1.5) cm (W=9.4; P<0.01) V_{prostate} at 31 (22–42) cm³ (W=8.5; P<0.01), QoL by 3 (2–4) points (W=11.2; P<0.01). The median Q_{max} increased by 23 (15–29) ml/s (W=13.3; P<0.01). The median values of the IPSSirritative and IPSSnocturia domains did not change significantly (P<0.8 and P<0.6, respectively). At 3 months after PVP, 84 (94.6%) patients restored sexual activity. In 33 (39.28%) of them, an improvement in erection and 15 (17.85%) deterioration were found. 61 (72.26%) lost emission.

Conclusions. The most significant effect of PVP on ejaculatory function is the loss of emission. The effect of PVP on erection is multidirectional and manifests itself in its improvement and deterioration. Further research is needed to determine the mechanisms by which PVP affects erection and ejaculation in order to prevent negative effects.

Keywords: sexual function, erection, ejaculation, photoselective laser vaporization of the prostate, green laser.

Фотоселективная лазерная вапоризация простаты при доброкачественной простатической обструкции: у фокусе сексуальная функция

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Мета дослідження: визначення впливу фотоселективної лазерної вапоризації (ФВП) на окремі домени ПЕФ (сексуальна активність, лібідо, ерекція, еякуляція, оргазм, задоволеність статевим актом) у сексуально активних чоловіків з ДПО, а також чинники, від яких цей вплив залежить. **Матеріали та методи.** Була виконана ФВП (апарат GreenLight XPS, МоxyFiber) 95 сексуально активним пацієнтам з доброкачественною простатичною обструкцією (ДПО) (об'єм передміхурової залози >40 см³, максимальна швидкість сечовипускання Q_{max} <10 мл/с; QoL_{≥4}) віком від 45 до 60 років. До втручання та через 3 міс після оцінювали сексуальну функцію (ПЕФ), параметри сечовипускання (PSS/QoL, PVR, Q_{max}), об'єм простати, внутрішньоміхурову протрузію простати, ПСА.

Результати. PVP статистично достовірно та клінічно вагомо вплинуло на параметри сечовипускання, що характеризують обструкцію, розміри передміхурової залози та QoL. Медіана IPSS_{obstructive} зменшилася на 6 (4–7) балів (W=7,6; P<0,01), PVR на 48 (38–60) мл (W=6,2; P<0,01), IPP на 0,9 (0,5–1,5) см (W=9,4; P<0,01) V_{простата} на 31 (22–42) см³ (W=8,5; P<0,01), QoL на 3 (2–4) бали (W=11,2; P<0,01). Медіана Q_{max} збільшилася на 23 (15–29) мл/с (W=13,3; P<0,01). Медіанні показники доменів IPSS_{irritative} та IPSS_{nocturia} достовірно не змінилися (відповідно P<0,8 та P<0,6). Через 3 міс після PVP статеву активність відновили 84 (94,6%) пацієнта. У 33 (39,28%) з них виявлено погіршення ерекції, у 15 (17,85%) осіб – погіршення, 61 (72,26%) пацієнт втратив емісію.

Заключення. Найбільш суттєво PVP впливає на еякуляторну функцію, що проявляється у втраті емісії. Вплив PVP на ерекцію має різнонаправлений характер і проявляється в її покращенні та погіршенні. Необхідні подальші дослідження для визначення механізмів впливу PVP на ерекцію та еякуляцію з метою профілактики негативних ефектів.

Ключові слова: сексуальна функція, ерекція, еякуляція, фотоселективна лазерна вапоризація простати, зелений лазер.

Фотоселективная лазерная вапоризация простаты при доброкачественной простатической обструкции: в фокусе сексуальная функция

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Цель исследования: определение влияния фотоселективной лазерной вапоризации (ФВП) на отдельные домены ПЕФ (сексуальная активность, либидо, эрекция, эякуляция, оргазм, удовлетворенность половым актом) у сексуально активных мужчин с ДПО, а также факторы, от которых это влияние зависит.

Материалы и методы. Была выполнена ФВП (аппарат GreenLight XPS, MoxyFiber) 95 сексуально активным пациентам с доброкачественной простатической обструкцией (ДПО) (объем предстательной железы >40 см³, максимальная скорость мочеиспускания Q_{max} <10 мл/с; QoL_{≥4}) в возрасте от 45 до 60 лет. До вмешательства и через 3 мес после оценивали сексуальную функцию (ПЕФ), параметры мочеиспускания (PSS/QoL, PVR, Q_{max}), объем простаты, внутриспузырную протрузию простаты, ПСА.

Результаты. PVP статистически достоверно и клинически весомо повлияло на параметры мочеиспускания, характеризующие обструкцию, размеры предстательной железы и QoL. Медиана IPSS_{obstructive} уменьшилась на 6 (4–7) баллов (W=7,6; P<0,01), PVR на 48 (38–60) мл (W=6,2; P<0,01), IPP на 0,9 (0,5–1,5) см (W=9,4; P<0,01) V_{простата} на 31 (22–42) см³ (W=8,5; P<0,01), QoL на 3 (2–4) балла (W=11,2; P<0,01). Медиана Q_{max} увеличилась на 23 (15–29) мл/с (W=13,3; P<0,01). Медианные показатели доменов IPSS_{irritative} и IPSS_{nocturia} достоверно не изменились (соответственно P<0,8 и P<0,6). Через 3 мес после PVP половую активность восстановили 84 (94,6%) пациента. У 33 (39,28%) из них выявлено улучшение эрекции, у 15 (17,85%) – ухудшение, 61 (72,26%) пациент потерял эмиссию.

Заклучение. Наиболее существенно PVP влияет на эякуляторную функцию, что проявляется в потере эмиссии. Влияние PVP на эрекцию имеет разнонаправленный характер и проявляется в ее улучшении и ухудшении. Необходимы дальнейшие исследования для определения механизмов влияния PVP на эрекцию и эякуляцию с целью профилактики негативных эффектов.

Ключевые слова: сексуальная функция, эрекция, эякуляция, фотоселективная лазерная вапоризация простаты, зеленый лазер.

The development of benign prostatic obstruction (BPO), defined as a condition of obstructive urination caused by benign prostatic hyperplasia [1], occurs in the middle age group – 45–60 years. Although there is a gradual degradation of sexual function (SF) during the same period, a significant proportion of men with BPO remain sexually active [2]. This fact puts the preservation of SF in a number of key criteria when choosing a method of correction of urination in this group of patients.

Despite the proven efficacy of uroselective alpha-blockers and 5-alpha-reductase inhibitors, transurethral ablation techniques for the elimination of BPO continue to be actively used. Moreover, in the last 20 years this direction has developed dynamically. The result of this development has been a steady downward trend in the popularity of transurethral prostate resection (TURP) in favor of alternative technologies [3–5]. Thus, in Australia for the period 2008–2017, the share of TURP in the total number of surgical procedures for BPO decreased by 25%. On the contrary, in the period from 2014 to 2019, the levels of use of photoselective laser vaporization of the prostate (PVP) and holmium laser enucleation of the prostate increased, respectively, to 16% and 6%.

This spread of Greenlight technology is largely due to its inherent features of biological action. Thus, the process of ablation of adenomatous tissue when using PVP is radically different from TURP, and is largely due to the phenomenon of vaporization – the formation of vapor bubbles when the tissue fluid is instantly heated to ultra-high temperatures. The blisters, increasing in volume, disrupt the integrity of the tissue, separating the fragments. Due to their small size, their evacuation from the bladder cavity, unlike «chips», does not require a separate procedure. In turn, the principle of photoselectivity is the use of laser radiation of the green part of the spectrum (wavelength 532 nm), which is mainly absorbed by biological structures of red color (erythrocytes, vessels). Such selectivity of absorption allows to increase productivity of ablation (laser energy is not lost in washing liquid) and to reduce probability of bleeding and formation of thrombi (fast coagulation and sealing of vessels).

Since the first notification of the use of PVP in BPO in 2002, a number of publications and several meta-analytical reviews have been published that provide information on its effects on SF. However, a detailed acquaintance with these works draws attention to a number of methodological shortcomings. Thus, one of the significant problems is the use of locally adapted questionnaires (Danish prostate symptom score sexual items, seven-grade Likert scale [6], Sexual health Inventory for men [7, 8]) instead of IIEF. On the other hand, robots, where only the total IIEF domain serves as a measure of the effect, do not allow to determine changes in individual domains. Other shortcomings include inconsistency in the term of the effect assessment, which ranges from 1 to 52 months [7], insufficient sample size (6-7 observations) [9], vapoenucleation instead of vaporization [10].

All of the above complicates the generalized assessment of the effect of PVP on SF. Under these circumstances, we conducted a study to determine the effect of PVP on certain IIEF domains (sexual activity, libido, erection, ejaculation, orgasm, sexual satisfaction) in sexually active men with BPO, as well as the factors from which this effect depends.

Patients and methods

Patients were included in the study after giving informed consent. Inclusion criteria: age 45-60 years; diagnosed with BPO: prostate volume >40 cm³, maximum urination rate Q_{max} <10 ml/s (calculated according to the 2 c rule) with a urination volume ≥125 ml; QoL ≥4; no effect from the previous drug therapy of BPO, which should have lasted at least 3 months before inclusion; involvement in stable heterosexual relationships lasting at least 6 months before inclusion. Exclusion criteria: cancer of any location, neurogenic urination disorders, anatomical defects of the penis (Peyronie's disease, penile implant, urethral stricture), permanent urethral catheter / epicystostomy, bladder stone, surgery on the forearm.

The following examination was performed on patients who met the criteria: history taking; assessment of symptoms of urination and sexual function on the IPSS/QoL, IIEF scales; determination of intravesical protrusion of the prostate (IPP),

Table 1

Preoperative data

Parameter, measure	Value
Age, Me (25–75), years	55 (51–57)
Diabetes mellitus, n (%)	17 (17,98)
Arterial hypertension, n (%)	68 (71,57)
Obesity, n (%)	54 (56,84)
Erectile dysfunction n (%)	67 (70,52)
IPSS, Me (25-75)	19 (17–23)
Obstructive symptoms IPSS, (Q5+6) Me (25–75)	8 (7–9)
Irritative symptoms IPSS (Q2+4) n (%)	67 (73,68)
Irritative symptoms IPSS (Q2+4) Me (25–75)	5 (4–6)
Nocturia IPSS, (Q7) n (%)	64 (67,36)
Nocturia IPSS, (Q7) Me (25–75)	3 (2–4)
QoL, Me (25–75)	5 (4–6)
V _{prostate} Me (25–75) cm ³	68 (54–90)
IPP n (%)	73 (76,84)
IPP Me (25–75), cm	1,5 (1–2,2)
Q _{max} , Me (25–75), ml/s	6 (5–8)
PVR n (%)	75 (78,94)
PVR, Me (25–75), cm ³	82 (66–110)

Preoperative assessment of sexual function

Item	Parameter	Percentage of patients according to choice of answer, %				
		Answer				
		1	2	3	4	5
		Never	A few times	Sometimes	Most times	Allways
IIEF1	Ability to get an erection	-	17,89	50,52	24,21	7,36
IIEF2	Ability to penetrate	-	20	48,4	26,31	5,26
IIEF3	Ability to penetrate	-	16,84	46,31	30,52	6,31
IIEF4	Ability to maintain an erection	-	13,68	56,84	26,31	3,15
IIEF7	Frequency of Intercourse satisfaction	-	11,57	38,94	47,36	2,1
IIEF9	Ability to ejaculate	-	8,42	14,73	24,21	52,63
IIEF10	Frequency of orgasm	-	3,15	6,31	30,52	60,00
IIEF11	Frequency of sexual desire	-	18,94	21,1	54,73	4,21
IIEF5	Difficulty with maintaining an erection	Extremely difficult	Very difficult	Difficult	Slightly difficult	No difficult
		7,36	7,36	61	22,1	2,1
IIEF6	Sexual activity	1-2 attempts	3-4	5-6	7-10	>11
		60,00	29,47	9,47	1,05	-
IIEF8	Intercourse enjoyment	No enjoyment	Not very enjoyable	Fairly enjoyable	Highly enjoyable	Very highly enjoyable
		-	4,21	9,47	77,89	8,42
IIEF12	Level of sexual desire	Very low or none	Low	Moderate	High	Very high
		-	15,78	32,63	49,47	2,1
		Very dissatisfied	Moderately dissatisfied	Equally satisfied and dissatisfied	Moderately satisfied	Very satisfied
IIEF13	Satisfaction with overall sex life	7,36	33,68	14,73	43,15	6,31
IIEF14	Satisfaction with relationships with a partner	6,31	15,78	8,42	63,31	8,42
		Very low	Low	Moderate	High	Very high
IIEF15	Rate of confidence in erection	7,36	49,47	26,34	11,57	5,26

the volume of residual urine PVR (using transabdominal ultrasound); the volume of the prostate and adenomatous nodes (using TRUZD); general clinical tests, PSA.

Examinations were performed 1–3 days before PVP – visit V0, and 3 months (7 days) after – visit V 3 m.

PVP was performed on a GreenLight XPS device with a wavelength of 523 nm and a power of 180 W. MoxoFiber fibers were used. During vaporization, the bladder cavity was actively washed with saline using a uropump.

Statistical analysis: Distribution by attribute represented as fraction or Me and percentile (25–75). The Wilcoxon test (criterion z) and criterion χ^2 were used to assess the significance of differences before and after treatment. The level of significance should not exceed 0.05.

RESULTS

In the period from 2018 to 2020, the study included 95 sexually active patients with BPO who met the criteria. Data from preoperative examination and assessment of sexual function are presented in tables 1 and 2.

According to them, all patients (according to the study plan) belonged to the middle age group. More than 2/3 of them were diagnosed with erectile dysfunction (ED), and risk factors for its occurrence were registered – hypertension, obesity, diabetes mellitus (in the order of frequency killing). All patients retained the ability to achieve, maintain an erection and perform vaginal penetration. However, 93 (97.9%) reported difficulty maintaining an erection of varying severity. In general, this corresponded to a rather low level of confidence in her.

Table 3

Change in the level of sexual activity of IIEF6 after PVP

Visit	Percentage of patients according to choice of answer, %			
	Answer			
	1–2 attempts	3–4	5–6	7–10
Baseline n=95, %	60,00	29,47	9,47	1,05
V3m n=84, %	89,28	8,33	2,38	-

Table 4

Distribution of patients by choice of answer to question IIEF1-5,15 in subgroups formed by the type of change in erectile function, 3 months after PVP

Item	Subgroup according to change of erection	Percentage of patients according to choice of answer, %					x ²	P
		Answer						
		1	2	3	4	5		
		Never	A few times	Sometimes	Most times	Allways		
IIEF1	Improved n=33	-	-	24,24	66,66	9,09	11,992	0,01
	Unchainged n=36	-	13,88	27,77	38,88	19,44	-	-
	Worsened n=15	53,33	33,33	13,33	-	-	19,828	0,001
IIEF2	Improved n=33	-	-	30,30	63,63	6,06	5,885	0,25
	Unchainged n=36	-	19,44	25,02	41,66	13,88	-	-
	Worsened n=15	0,60	26,66	13,33	-	-	16,392	0,005
IIEF3	Improved n=33	-	-	33,34	54,54	12,12	3,951	0,5
	Unchainged n=36	-	16,66	27,92	38,88	16,66	-	-
	Worsened n=15	0,60	33,33	6,66	-	-	19,977	0,001
IIEF4	Improved n=33	-	-	21,21	69,7	9,09	14,151	0,005
	Unchainged n=36	-	13,88	52,77	25,05	8,33	-	-
	Worsened n=15	53,33	33,33	13,33	-	-	18,911	0,001
		Extremely difficult	Veri difficult	Difficult	Slightly difficult	No difficult		
IIEF5	Improved n=33	-	9,09	9,09	75,76	6,06	27,149	0,001
	Unchainged n=36	11,11	8,33	58,33	16,68	5,55	-	-
	Worsened n=15	66,66	33,33	-	-	-	25,465	0,001
		Very low	Low	Moderate	High	Very high		
IIEF15	Improved n=33	-	15,15	51,51	18,18	15,15	25,465	0,001
	Unchainged n=36	11,11	41,66	22,22	11,11	13,88		
	Worsened n=15	73,33	20	6,67	-	-	10,847	0,05

Influence of various factors on the probability of improvement / deterioration of erection after PVP

Factor	Value	Improved		χ ²	P	Worsened		χ ²	P
		+	-			+	-		
V prostate cm ³	40-60	5	19	25,569	0,001	10	19	8,119	0,05
	61-80	10	2			4	2		
	81-100	17	4			-	4		
	>100	1	10			1	10		
ED severity IIEF5	Severe IIEF5: 1-7	2	3	14,175	0,005	9	3	2,501	0,50
	Moderate I IIEF5: 8-11	5	18			4	18		
	Mild-moderate IIEF5: 12-16	22	12			2	12		
	Mild IIEF5: 17-2	4	3			-	3		
Emmision lost	Yes	19	33	4,867	0,05	9	33	2,159	0,10
	No	14	3			6	3		

Irregular ejaculation (answer option «several times» or «sometimes») was indicated by 22 (23.15%) patients. At the same time, no cases of its complete absence were registered. However, the vast majority rated the sexual intercourse as «very pleasant».

It is noteworthy that about half of the respondents described the level of their sexual desire as «high», and another third as «moderate». In addition, despite belonging to the middle age group, a significant proportion (38.94%) registered quite high levels of sexual activity for this age ≥3 times.

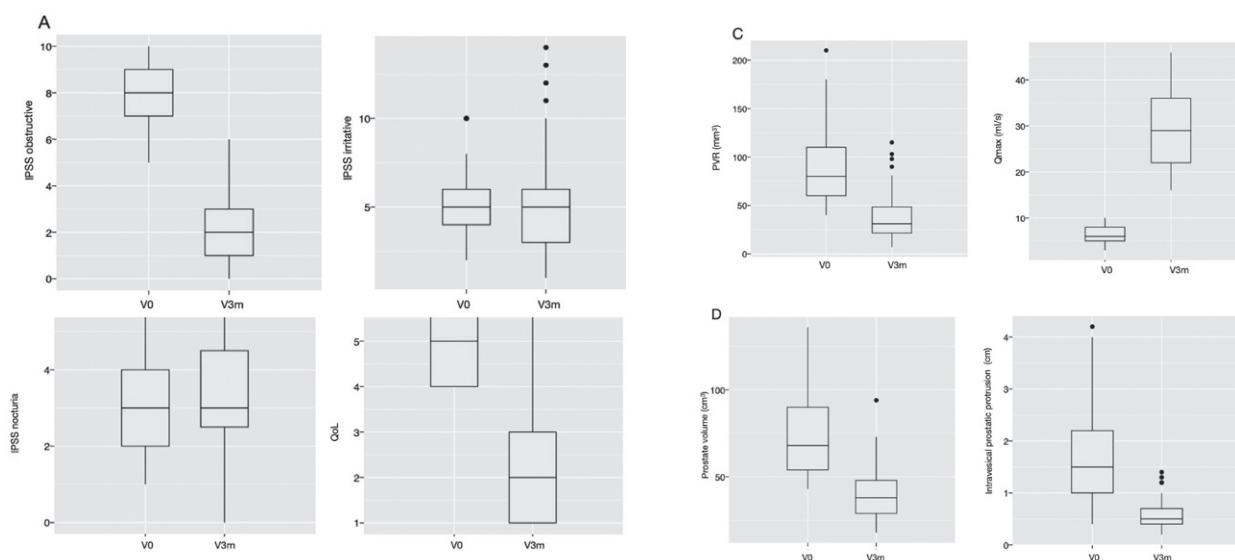
According to the level of general satisfaction with sexual life, most patients were divided into 2 subgroups: «moderately dissatisfied» and «moderately satisfied». On the contrary, for 2/3 were «moderately satisfied».

Three months after PVP, statistically significant and clinically significant changes in urinary parameters characterizing obstruction, prostate size, and QoL were detected (figure1). In particular, the median IPSS_{obstructive} decreased by 6 (4-7) points (z=-8.463; P<0.0001), PVR by 48 (38-60) ml (z=-7.5248; P<0.0001), IPP by 0.9 (0.5-1.55) cm (z=-1.7824; P=0.037), V_{prostate} at 31 (22-42) cm³ (z=-8.463; P<0.0001), QoL at 3 (2-4) points (z=-8.1414; P<0.0001). The median

Qmax increased by 23 (15-29) ml/s (z=-8.463; P<0.0001). The decrease in the IPSS_{nocturia} domain reached the level of statistical significance (z=-3.139; P<0.0013) but was not clinically significant. In addition, the IPSS_{irritative} domain did not change significantly (z=-0.0036; P=1).

At 3 months after PVP, sexual activity was restored by 84 (94.6%) patients. However, its frequency in subgroups with a level > 2 times decreased. Thus, the proportion of patients who had sexual intercourse before vaporization «3-4 times» or «5-6 times» decreased by 21.14% and 7.09%, respectively (χ²=18.581; v=3; P<0.001) (Table 3).

The IIEF1-5.15 survey revealed 33 (39.28%) cases of erectile dysfunction and 15 (17.85%) cases of erectile dysfunction. In the subgroup with improved erection, the proportion of patients able to achieve and maintain it in «most cases» was 27.78% and 44.65% higher than in the subgroup with unchanged erection (Table 4). In addition, these subgroups differed significantly in the proportion of patients for whom maintaining an erection was «slightly difficult». In particular, in the subgroup with improved erection, it was higher by 59.08%. In parallel, in the subgroup with



Changes in urination function (a, b, c) and prostate parameters (d) in the study group after PVP

improved erection, a significant increase in the proportion of patients with medium and high levels of confidence in erection was registered. On the other hand, PVP did not affect the distribution of patients by the ability to perform introjection. Erectile dysfunction was significantly more common in patients with prostate volume $>80 \text{ cm}^3$ and moderate baseline ED (IIEF5 8–11).

Statistically significant differences in all parameters were registered between subgroups with unchanged and worsened erection (Table 4).

61 (72.26%) patients in response to IIEF9 «Ability to ejaculate» chose the option «never», which indicates a loss of ability to ejaculate.

Treatment did not affect the distribution of patients depending on the state of orgasmic function and libido (respectively $P=0.25$ and $P=0.5$).

An analysis of the relationship between certain factors and the likelihood of improvement or deterioration in response after PVP is presented in Table 5.

Discussion

Recently, the collateral effect of transurethral methods of BPO correction on SF has been in the focus of attention of the urological community. On the one hand, this is due to the current level of development of technologies that virtually eliminate the risk of death, thus shifting the emphasis when choosing a method of safety for life to preserve its quality. And on the other hand, awareness of the fundamental importance of sexual manifestations for a full existence, even after the launch of involutive aging processes. In such circumstances, with other comparable characteristics, preference will be given to methods that do not compromise the SF.

Despite the large amount of information, it is not possible to form a holistic picture of the effects of PVP on SF. Among the reasons for this are: inconsistency in the methods and timing of the effect assessment, technical aspects of the laser procedure (using different ablation methods – vaporization, enucleation, resection and different radiation power 80, 120, 180 W) and insufficient number of study groups [15–23].

The main purpose of this work was to determine the effects of PVP on certain categories of male SF: erection, ejaculation, libido and orgasm, sexual activity. Secondary was to determine the factors on which these effects depend. SF status was investigated using a standardized instrument (IIEF scale) in 95 sexually active middle-aged patients with BPO before and 3 months after PVP (wavelength 532nm, power 180W). The prevalence of ED risk factors and changes in prostate parameters and urinary function were also studied in the study population. The choice of a three-month period to assess the effect is justified by the need to exclude from the analysis of reversible changes in SF and those associated with the action of other factors (in particular, the natural progression of sexual dysfunction). It was found that the population of middle-aged men with BPO is characterized by a significant prevalence of ED (up to 70.5%) and its risk factors, among which dominate (obesity and hypertension). Despite erectile dysfunction, this group of men had a fairly high level of sexual activity and sexual desire. Also, all patients retained the ability to ejaculate.

Our study showed that PVP affects three components of sexual function: the level of sexual activity, erection and most importantly - ejaculation.

Although 94.6% of patients resumed sexual activity 3 months after PVP, the proportion of those who had sex >2 times decreased by a total of 28.2%. This fact indicates that the risk group for decreased sexual activity after PVP includes patients with a higher initial level.

The effect of PVP on erection was diverse. In 39.3% of cases, the erection improved, and in 17.9% – worsened. Erectile dysfunction was associated with factors such as initial prostate volume $>80 \text{ cm}^3$, initial ED of moderate IIEF5 (12–16 points). In contrast, erectile dysfunction was more common in baseline prostate volumes $>40 - <60 \text{ cm}^3$ and severe severe IIEF5 ED (1–7 points). Erection parameters such as the ability to achieve and maintain an erection improved: the proportion of patients who were able to do so in «most cases» increased by 27.8% and 44.7%, respectively. Also, the share of patients for whom maintaining an erection was «a little difficult» increased by 59.1%. At the same time, there was an increase in the proportion of patients with medium and high levels of confidence in erection. With the deterioration of the erection, negative changes took place on the part of all its parameters.

The possibility of both positive and negative changes in erectile function after PVP is reported by other researchers. In particular, Hossack T.A et al. 2012 [11] for 3 months after the use of a green laser with a power of 120W registered a significant deterioration in erectile function in 12.4% and a significant improvement in 8.3%. They have not been able to establish a link between changes in erectile function and changes in urinary function, quality of life and loss of emission. It is noteworthy that at 12 months of follow-up, the proportion of patients with erectile dysfunction increased to 24%, with improvement decreased to 6%.

To date, several theories have been proposed to explain changes in erectile function after PVP. In particular, erectile dysfunction is associated with the direct damaging effects of laser radiation on prostate tissue and the cavernous vessels / nerves that run along its posterior surface. It is noted that the risk of damage to the latter increases when the vaporization outside the surgical capsule or when conducting it in the apical area. We believe that the negative effect of PVP may also be caused by a postoperative decrease in the intensity of prostatic conversion of testosterone to dehydrotestosterone. But this assumption needs proof. However, our finding that erectile dysfunction after PVP is more common in patients with a small initial prostate volume ($>40 - <60 \text{ cm}^3$) is consistent with these theories. To explain the relationship between the initial size $>80 \text{ cm}^3$ and the improvement of erection, we proposed the hypothesis of «stretching». According to it, erections in patients with BPO may be the result of dilation of cavernous vessels and nerves by hypertrophied prostate. To test its ability in the future, we plan to investigate the change in blood flow in the cavernous arteries after vaporization.

Despite the importance of erection changes after PVP for the entire sexual cycle, still, this technique most significantly affected ejaculation. In particular, 61 (72.3%) patients reported emission loss for 3 months. Previously, we have shown that the risk of emission loss depends on the degree of intravesical prostatic protrusion [24, 25]. This corresponds to one of the mechanisms of emission loss – retrograde ejaculation, which occurs due to damage to the internal sphincter. In addition, a number of researchers do suggest that the loss of emission may be due to damage to the ejaculatory ducts. In further studies, we plan to determine which of these mechanisms is dominant by performing microscopy of urine after ejaculation. It is also important to establish the effect of tartar emission on the psycho-emotional state of the patient.

RESULTS

In summary, we can conclude that the main effects of PVP on sexual function are the second emission and multidirectional changes on the side of the erection. Further studies of the mechanisms of PVP's effect on sexual function are needed to prevent adverse effects.

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