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ASSESSMENT OF RISK FACTORS FOR DEVELOPMENT OF URETHRAL STRICTURES AND BLADDER NECK SCLEROSIS IN PATIENTS WHO HAVE UNDERWENT SURGERY FOR BENIGN PROSTATE HYPERPLASIA

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Abstract

Introduction. Urethral stricture and sclerosis of the bladder neck are the most common urological pathologies in men in various countries. The main cause of strictures is urethral fibrosis due to sexually transmitted infections, pelvic injuries, and surgical interventions.

The aim is to study the contribution of various risk factors to the development of urethral strictures and bladder sclerosis in patients undergoing surgery for benign prostatic hyperplasia (BPH).

Materials and methods. We conducted a retrospective epidemiological study of the prevalence of late complications of surgical intervention with calculation of odds ratio for each risk factors on a continuous sample of operated patients for three years, from 2019 to 2021 (total 702 people). The critical level for significance of differences in groups was accepted as $p < 0.05$. All statistical analysis procedures were performed using SPSS 20.

Results. Urethral strictures and bladder neck sclerosis occurred in the postoperative period in 4.9% of patients. The main risk factors with a statistically significant level were the emergency type of hospitalization (OR=0.015, $p=0.006$), the presence of infectious inflammation before surgery (OR=0.624, $p=0.042$) and the amount of residual urine before surgery (OR=1.014, $p=0.022$). High OR rates were also typical for transurethral resection of prostate (TURP), overweight and obesity, diabetes mellitus, and disease duration of more than a year.

Conclusion. When planning and performing surgical intervention for BPH, as well as when managing the patient in the postoperative period, it is necessary to take into account risk factors for the development of urethral strictures and sclerosis of the bladder neck in order to develop and implement preventive measures.

Keywords: urethral stricture, benign prostatic hyperplasia, sclerosis of the bladder neck, transurethral resection, odds ratio.

Резюме

ОЦЕНКА ВКЛАДА ФАКТОРОВ РИСКА В РАЗВИТИЕ СТРИКТУР УРЕТРЫ И СКЛЕРОЗА МОЧЕВОГО ПУЗЫРЯ У ПАЦИЕНТОВ, ПЕРЕНЕСШИХ ОПЕРАТИВНОЕ ВМЕШАТЕЛЬСТВО ПО ПОВОДУ ДОБРОКАЧЕСТВЕННОЙ ГИПЕРПЛАЗИИ ПРЕДСТАТЕЛЬНОЙ ЖЕЛЕЗЫ

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Введение. Стриктура уретры и склероз шейки мочевого пузыря являются одной из частых урологических патологий у мужчин в различных странах. Основные причины стриктур обусловлены фиброзом уретры, вследствие инфекций, передающихся половым путем, травм таза, оперативных вмешательств.

Целью исследования явилось изучение вклада различных факторов риска в развитие стриктур уретры и склероза мочевого пузыря у пациентов, перенесших оперативное вмешательство по поводу доброкачественной гиперплазии предстательной железы (ДГПЖ).

Материалы и методы. Мы провели ретроспективное эпидемиологическое исследование распространенности поздних осложнений оперативного вмешательства с расчетом отношения шансов для каждого из факторов риска на сплошной выборке из оперированных пациентов за три года – с 2019 по 2021 гг. (всего 702 человека). Критический уровень значимости различий в группах был принят, как $p < 0,05$. Все процедуры статистического анализа выполнялись с помощью программы SPSS 20.

Результаты. Стриктуры уретры и склероз шейки мочевого пузыря встречались в послеоперативном периоде у 4,9 % пациентов. Основными факторами риска, имеющими статистически достоверный уровень, послужили экстренный тип госпитализации (ОШ=0,015, $p=0,006$), наличие инфекционного воспаления до операции (ОШ=0,624, $p=0,042$) и количество остаточной мочи до операции (ОШ=1,014, $p=0,022$). Высокие показатели ОШ также были характерны для ТУРП, избыточного веса и ожирения, сахарного диабета, длительности заболевания более года.

Заключение. При планировании и проведении оперативного вмешательства по поводу ДГПЖ, а также при ведении пациента в послеоперационном периоде необходимо учитывать факторы риска развития стриктур уретры и склероза шейки мочевого пузыря с целью разработки и внедрения профилактических мероприятий.

Ключевые слова: стриктура уретры, доброкачественная гиперплазия простаты, склероз шейки мочевого пузыря, трансуретральная резекция, отношение шансов

Түйіндеме

ҚУЫҚ АСТЫ БЕЗІНІҢ ҚАТЕРСІЗ ГИПЕРПЛАЗИЯСЫ БОЙЫНША ОПЕРАЦИЯ ЖАСАЛҒАН НАУҚАСТАРДА УРЕТРА СТРИКТУРАСЫНЫҢ ЖӘНЕ ҚУЫҚ СКЛЕРОЗЫНЫҢ ДАМУЫНА ҚАУІП ФАКТОРЛАРЫНЫҢ ҮЛЕСІН БАҒАЛАУ

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Кіріспе. Үрпі стриктурасы мен қуық мойынының склерозы, көптеген елдерде ерлер урологиялық патологиясының жиі себептерінің бірі болып табылады. Стриктуралардың негізгі себептері жыныстық қатынаспен берілетін инфекцияның, жамбас жарақаттарының, операциялардың әсерінен үрпінің фиброзы. Зерттеу мақсаты қуық асты безінің қатерсіз гиперплазиясына байланысты операция жасалған науқастарда үрпі стриктурасы мен қуық склерозының дамуына әртүрлі қауіп факторлерінің әсерін зерттеу.

Материалдар мен әдістер. Біз қауіп қатер факторының әрқайсысына мүмкіндіктер қатынасын есептеу арқылы үш жылда операция жасалған науқастар арасында – 2019 ж. 2021 жж. (барлығы 702 науқас) операциялық араласулардың кеш асқынуларының таралуын ретроспективті эпидемиологиялық зерттеу жүргіздік. Топтардың әртүрлі қажеттілігінің критикалық деңгейі $p < 0,05$ болып қабылданды. Статистикалық сараптаманың барлық шаралары SPSS 20 бағдарламасы бойынша жасалды.

Нәтижелер. Үрпі стриктуралары мен қуық мойын склерозы операциядан кейінгі кезеңде 4,9 % науқастарда кездесті. Статистикалық нақты деңгейі бар негізгі қауіп факторлары, госпитализацияның жедел түрі (МҚ=0,015, $p=0,006$), операцияға дейінгі инфекциялық қабыну (МҚ=0,624, $p=0,042$) және операцияға дейінгі қалдық зәр мөлшері (МҚ=1,014, $p=0,022$). МҚ жоғарғы көрсеткіштері ҚТҮР-ға, артық салмақ және семіздік, бір жылдан аса созылмалы аурулар бар науқастарда болды.

Қорытынды. ҚБҚГ бойынша операциялық араласуларды жоспардау кезінде, сонымен қатар операциядан кейінгі кезеңде науқастарды жүргізуде, үрпінің стриктурасы мен қуық мойын склерозының алдын алу шараларын құрастыру және еңгізу мақсатында оның дамуының қауіп қатер факторлерін ескеру керек.

Түйінді сөздер: уретральды стриктура, қуықасты безінің қатерсіз гиперплазиясы, қуық мойын склерозы, трансуретральды резекция, ықтималдық қатынасы.

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Introduction

Benign prostatic hyperplasia (BPH) is common among adult and older men and affects their quality of life, sexual function, and genitourinary health. Transurethral resection of the prostate (TURP) is one of the leading surgical procedures for the treatment of BPH. It has proven itself well in clinical practice, with good efficacy and safety [17].

Urethral stricture and sclerosis of the bladder neck are the common urological pathologies in men in various countries. It is defined as a narrowing of the urethral lumen requiring interventions to improve urine flow rate.

The main causes of strictures are fibrosis of the urethra, due to sexually transmitted infections, pelvic injuries, and surgical interventions [14, 16]. The most difficult urethral strictures that require radical treatment are strictures with a length of more than 5 cm, posterior stenoses, the absence of previous symptoms from the lower urinary tract and traumatic strictures [10].

The incidence and factors contributing to the development of urethral stricture after TURP are still a matter of debate. In a study by Indian scientists, the incidence of urethral strictures after bipolar TURP was 4.3%. An increased risk of developing strictures is associated with a small meatal canal size [12]. In patients with large prostate glands, the risk of developing postoperative urethral strictures increases, the incidence rate increases to 19% [4, 11].

Stenosis or sclerosis of the bladder neck is a long-term complication of surgical interventions for benign prostatic hyperplasia. The overall incidence of this pathology is 1.3% after TURP, 0.66% after enucleation and 1.2% after ablation [2].

A number of studies have found that the risk of developing urethral strictures and sclerotic changes in the bladder neck is associated with the presence of inflammatory diseases of the prostate gland, the type of surgery, the diameter of surgical instruments, the use of a urethral catheter, and a large volume of the prostate before surgery [7, 15].

The aim is to study the contribution of various risk factors to the development of urethral strictures and bladder sclerosis in patients undergoing surgery for benign prostatic hyperplasia.

Materials and methods.

In order to study the main risk factors for the development of late complications after open adenectomy and transurethral resection for benign prostatic hyperplasia, we conducted a retrospective epidemiological study of the prevalence of late complications of surgical intervention (urethral strictures and sclerosis of the bladder neck). Then we did calculation of the odds ratio for each of the risk factors on continuous a sample of operated patients in the urology departments of two clinics in Semey, the Emergency Hospital and the Kidney Center institution, for three years (from 2019 to 2021). A total of 702 people underwent surgical treatment. Information about the risk factors was obtained from patient records. The social and demographic characteristics of the individuals included in the epidemiological study are presented in Table 1. The vast majority of patients were in the age range from 61 to 80 years (82.7%) and were urban residents. Most of the patients were hospitalized as planned.

Table 1.

Social and demographic characteristics of studied patients.

Characteristics	N	%	
Age (years)	40-50	4	0,6%
	51-60	118	16,7%
	61-70	361	51,4%
	71-80	219	31,3%
Residency place	City	526	75,0%
	Settlement	176	25,0%
Type of hospitalization	Planned	443	63,2%
	Emergency	259	36,8%

Inclusion criteria:

- 1) Patients with benign prostatic hyperplasia after adenomectomy aged 50 to 80 years;
- 2) Patients with benign prostatic hyperplasia after transurethral resection of the prostate gland aged 50 to 80 years.

Exclusion criteria:

- 1) Patients with urethral stricture diagnosed before surgery;
- 2) Patients with benign prostatic hyperplasia with concomitant psychiatric diseases;
- 3) Patients with malignant prostatic hyperplasia;
- 4) Patients with acute kidney injury or chronic renal failure;
- 5) Age of patients over 80 years;
- 6) Refusal to participate in the study.

The assessment of laboratory tests included a general urinalysis using a hardware method, in which the greatest interest was the determination of protein, the number of leukocytes and erythrocytes, since these indicators indicated the severity of local inflammatory reactions.

Transabdominal ultrasound examination of the prostate with determination of residual urine volume was performed in all patients included in the study. The method allows you to evaluate the structure of the organ, the condition of the surrounding tissues, and the volume of residual urine in the bladder. The method of studying urodynamics is uroflowmetry, which evaluates the duration and volumetric flow rate of urine. A decrease in uroflowmetry indicators indicates the presence of bladder outlet obstruction of the urethra.

To assess the dynamics of the severity of dysuric symptoms, we used the IPSS scale (International Prostate Disease Summary System), which makes it possible to determine the severity of symptoms and choose a rational treatment method accordingly. Number of points: from zero to seven indicates minor disturbances, from eight to 19 - moderate disturbances, from 20 to 35 indicates severe symptoms of the disease.

The results of the study were analyzed using descriptive statistics methods. To assess the contribution of each risk factor to the development of late postoperative complications, odds ratios were calculated, which are a characteristic for quantitatively describing the closeness of the relationship between signs in a certain statistical population. The critical level of significance of differences in groups was accepted as $p < 0.05$. All statistical analysis procedures were performed using SPSS 20.

Results

Table 2 presents data on the main risk factors for the formation of late complications of surgical treatment of BPH in the studied patients. The main risk factors studied were the presence of diabetes mellitus (18%), overweight or obesity (21.1%), disease duration of more than one year before surgery (76.9%), lack of preoperative therapeutic treatment (20.9%), emergency type of hospitalization (36.8%), type of surgical intervention, presence of inflammatory reactions before surgery (18.1%), prostate size before surgery more than 45 cm³ (17.8%), volume of residual urine before surgery more than 150 ml (79.9%), average IPSS score before surgery.

Table 2.

Characteristics of risk factors of studied patients.

Characteristics	N	%	
Diabetes Mellitus of 2 type	yes	126	18,0%
	no	576	82%
Body mass index	< 30	554	79,9%
	> 30	149	21,1%
Duration of disease	< 12 months	162	23,1 %
	12 months >	540	76,9%
Conservative treatment before surgery	yes	555	79,1%
	no	147	20,9%
Type of hospitalization	planned	443	63,2%
	emergent	259	36,8%
Leukocyturia before surgery	yes	127	18,1 %
	no	575	81,9%
Type of surgical treatment	TUR BPH	335	47,8%
	adenomectomy	367	52,2%
Volume of residual urine before surgery	100-149 ml	141	20,1%
	150 ml >	561	79,9%
Prostate size before surgery	< 45 cm ³	125	17,8%
	> 45 cm ³	577	82,2%
Average IPSS score before surgery	8-19 points	99	14,1%
	20-35 points	603	85,9%
Urethral strictures and sclerosis of the bladder neck 6 months after surgery	yes	29	4,1 %
	no	673	95,9%

Table 3 presents the odds ratios for the development of late complications after surgery for BPH. The results of the analysis indicate that people of different ages have almost the same chances of developing urethral strictures and sclerosis of the bladder neck ($p = 0.134$), however, the negative value of coefficient B indicates some protective effect of increasing age in relation to the development of complications. It may be associated with a more pronounced inflammatory reaction to surgery in young people due to a better immune response and increased proliferation of epithelial cells.

An increase in body mass index above 30 is accompanied by a 1.641-fold increase in the odds of developing urethral strictures and bladder neck sclerosis, but this indicator did not have a statistically significant level. The same trend was observed for diabetes mellitus (OR=1.734) and disease duration (duration of more than a year increased the risk of developing late complications by 2.702 times), but without a statistically significant level.

Table 3.

Odds ratios for risk factors for late complications of surgical treatment of BPH.

Факторы риска	B	OR	95% confidence interval		p
			lower limit	upper limit	
Age	-0,085	0,919	0,823	1,026	0,134
Body mass index	0,495	1,641	0,563	4,786	0,364
Diabetes Mellitus of 2 type	0,55	1,734	0,155	19,439	0,655
Duration of disease	0,994	2,702	0,838	8,712	0,096
Conservative treatment before surgery	-0,555	0,574	0,085	3,892	0,57
Type of hospitalization	-4,178	0,015	0,001	0,293	0,006
Leukocyturia before surgery	-0,471	0,624	0,396	0,983	0,042
Type of surgical treatment	-0,469	0,625	0,301	1,299	0,208
Volume of residual urine before surgery	0,014	1,014	1,002	1,026	0,022
Average IPSS score before surgery	0,004	1,004	0,855	1,178	0,964
Prostate size before surgery	0,026	1,026	0,938	1,122	0,574

Conservative therapy before surgical treatment had a protective effect, reducing the risk of developing late complications of surgery by 0.574 times. Planned hospitalization had a more favorable effect on the formation of urethral strictures and sclerosis of the bladder neck in comparison with emergency type of hospitalization (OR=0.015), the result had a statistically significant level (p<0.01). A statistically significant level was also established for leukocyturia before surgery: its absence also had a beneficial effect on long-term results of surgery (OR=0.624; p<0.05).

The type of surgical treatment also played a significant role in the formation of urethral strictures. Thus, transvesical adenomectomy led to a lower risk of late postoperative complications in comparison with transurethral resection by 0.624 times. When calculating the odds ratio for TUR to adenomectomy, this indicator reached 1.79, but no statistically significant level was observed.

An increase in the volume of residual urine in the bladder before surgical treatment by more than 150 ml led to an increase in the risk of late complications by 1.014 times, while statistically significant differences were noted in comparison with persons in whom this indicator was lower. The total IPSS score did not affect the risk of developing urethral stricture (OR=1.004), the indicator did not have a statistically significant level. The same situation occurred with regard to the size of the prostate before surgery; the result did not have a statistically significant level. This fact can be explained by the fact that for large glands, the preferred method of surgical treatment was transvesical adenomectomy, which is more favorable with respect to the development of late complications.

Discussion

Analysis of the study results indicates that urethral strictures and bladder neck sclerosis occurred in the postoperative period in 4.9% of patients. The main risk factors with a statistically significant level were the emergency type of hospitalization, the presence of infectious inflammation before surgery and the amount of residual urine before surgery. High OR rates were also typical for overweight and obesity, diabetes mellitus, and

disease duration of more than one year. These data are consistent with the results of other studies, which demonstrate the prevalence of late postoperative complications in 3.9–6.4% of patients [3]. Statistically significant risk factors for complications are a long surgical time, the presence of concomitant diseases such as diabetes mellitus and obesity (p<0.01; 0.01, respectively) [8], weight of the gland before surgery (p<0.01) [9]. Preoperative antibiotic treatment showed a protective effect (p = 0.042), and a positive preoperative urine culture was a predictor of bladder neck sclerosis (p = 0.021) [6].

In another study, important risk factors for developing urethral stricture were stricture length greater than 2 cm (p = 0.024), older age (p = 0.042), being overweight (p = 0.021), and previous urethral procedures (p = 0.021) [13]. A study conducted by Turkish authors to assess the rate of development of urethral strictures and risk factors after bipolar transurethral resection of the prostate showed that six months after surgery this complication developed in 10.5% of patients. A higher incidence of urethral strictures was observed in patients who underwent transurethral resection of the prostate for the second time (p = 0.007), with the use of a catheter before surgery (p = 0.009), with a high level of leukocyturia before surgery (p = 0.013), as well as in patients with a long-term postoperative catheterization (p=0.046) [1]. The results of a systematic review with meta-analysis showed an increase in the development of urethral strictures after TURP compared with enucleation and ablation procedures. The main predictors of complications are the use of monopolar energy, instrument caliber and duration of postoperative catheterization [5].

Conclusion

Urethral stricture and bladder neck sclerosis are late postoperative complications of surgical interventions for benign prostatic hyperplasia. Independent predictors of this complication were transurethral resection of the prostate, duration of the disease, the presence of diabetes mellitus, emergency hospitalization of the patient, bacterial inflammation before surgery, and the amount of residual urine before surgery. When planning and conducting surgical intervention, as well as when managing the patient

in the postoperative period, it is necessary to take these factors into account in order to develop and implement preventive measures.

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